AD-A167 845

USER'S GUIDE FOR CONDUCTING
COLLECTIVE FRONT-END ANALYSIS (CFEA)

Bryan E. Brett, William A. Chapman,
and Tarrance E. Saunders
Applied Science Associates, Inc.

DTIC
ELECTE
MAY 1 9 1986
S
D
D

for

ARI Field Unit at Fort Bliss, Texas
Michael H. Strub, Chief

SYSTEMS RESEARCH LABORATORY
Jerrold M. Levine, Director

ari

U. S. Army
Research Institute for the Behavioral and Social Sciences

March 1985

DTIC FILE COPY

86 5 16 081

U. S. ARMY RESEARCH INSTITUTE

FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the

Deputy Chief of Staff for Personnel

EDGAR M. JOHNSON
Technical Director

L. NEALE COSBY
Colonel, IN
Commander

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ARI Research Note 85-31	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) USER'S GUIDE FOR CONDUCTING COLLECTIVE FRONT-END ANALYSIS (CFEA)		5. TYPE OF REPORT & PERIOD COVERED Final Report, volume 1 April 82 - June 83
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Bryan E. Brett, William A. Chapman and Tarrance E. Saunders		8. CONTRACT OR GRANT NUMBER(s) MDA 903-82-C-0423
9. PERFORMING ORGANIZATION NAME AND ADDRESS Applied Science Associates, Inc. Box 158 Valencia, PA 16059		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2Q263731A792 1124
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, VA 22333-5600		12. REPORT DATE March 1985
		13. NUMBER OF PAGES 86
14. MONITORING AGENCY NAME & ADDRESS(If different from Controlling Office) - -		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

- -

18. SUPPLEMENTARY NOTES

Michael H. Strub, contracting officer's representative

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Collective Training	Mission
Collective Task	Mission Analysis
Collective Front-End Analysis	Task Analysis
Systems Approach	Criticality Assessment

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides instructions for conducting collective front-end analysis (CFEA). CFEA is the process by which the critical missions and collective tasks of a unit are specified. The CFEA process begins with specification of a unit mission, proceeds to specification of unit element missions, and ends with delineation and description of collective tasks. Products of CFEA serve as input for the development of collective training materials such
(over)

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

i

ARI Research Note 85-31

20. (continued)

as Army Training and Evaluation Programs (ARTEPs) and drills. A twenty-one step process for conducting CFEA is presented. Both managerial and technical activities are described. Examples of products generated in the process are provided along with aids for performing some of the steps in the process.

TABLE OF CONTENTS

LIST OF TABLES

iii

LIST OF FIGURES

SECTION I

INTRODUCTION

This handbook provides instructions for conducting collective front-end analysis (CFEA). In addition, it provides aids for performing some of the steps in CFEA and gives examples of products generated by the process. Managerial as well as technical activities are described.

The handbook is intended to be a supplement and extension of CFEA procedures described in TRADOC Pamphlet 310-8, Collective Front-End Analysis for Development of the Army Training and Evaluation Program (ARTEP). Use of procedures described in the handbook does not require an existing knowledge of the CFEA process. However, some familiarity with front-end analysis and training development procedures in general is needed. A basic course in the instructional systems development (ISD) process is sufficient.

In the section that follows a brief overview of the CFEA process is provided. Instructions for performing CFEA are provided in Section II.

Overview of the CFEA Process

Collective Training

By their very nature, military fighting units depend heavily upon the integrated performance of personnel to accomplish their assigned missions. This teamwork is required at a variety of levels within a unit. It ranges from tasks performed by crews (e.g., a tank crew engaging an enemy tank), to performance of a mission by a unit echelon (e.g., a rifle company assaulting a hill), to the combined efforts of all echelons of a unit to accomplish a unit mission (e.g, a HAWK Air Defense Artillery Battalion defending an airfield over a sustained period of time). In recent years there has been growing recognition of the importance of collective or team performance to unit success and the need to train this performance at the various levels at which it occurs.

Development of team performance in a unit is called collective train-
ing. Collective training seeks to develop two types of performances:
collective tasks and missions. A collective task is formally defined as
a unit of work requiring two or more individuals for its completion, having
an identifiable start and end point, and resulting in a measurable accomplish-
ment or product. Missions are defined as major activities performed by
echelons or organizational elements of a unit. Missions usually require the
combined performance of a number of collective and individual tasks.

Two of the primary means used to deliver collective training are drills
and Army Training and Evaluation Programs (ARTEPs). Drills are short exer-
cises designed to develop crew proficiency for performing collective tasks.
They provide a detailed description of the actions of each crew member dur-
ing performance of the task. In addition, conditions and standards for
task performance are provided. The ARTEP is a plan that is followed by
a battalion and its different echelons for training and evaluating the var-
ious missions it is expected to perform. For a given battalion mission an
ARTEP provides a breakout of the missions performed by battalion elements
in support of that mission. In addition, a listing of the tasks that support
each battalion element mission is provided along with conditions and standards
for performance. Using an ARTEP, unit training developers can easily de-
termine which tasks must be trained to develop proficiency in the performance
of any one mission. When used in combination, drills and the ARTEP provide
for training in the complete range of a unit's collective performances.

Collective Front-End Analysis

Both drills and ARTEPs hold much promise for serving the collective
training needs of units. However, the effectiveness of unit training result-
ing from the use of these materials is largely dependent upon the extent to
which missions and tasks critical to unit success are addressed and the pre-
cision with which they are described. TRADOC Pamphlet 310-8 specifies CFEA
as the process by which the critical missions and collective tasks of a

I-2

battalion are to be derived. Critical missions and collective tasks are those missions and tasks that have a significant influence on the outcome of a unit mission or the survival of unit personnel and equipment. The purposes of a CFEA are to specify collective performances that should be trained, and to describe those performances in sufficient detail to permit development of collective training materials. Emphasis is placed on critical missions and tasks because it is recognized that training resources are limited and should not be wasted training missions and tasks that have little to do with unit success. Given that CFEA is the first step in developing collective training materials, the quality of the CFEA has a major impact on the quality of the training materials to be produced.

Figure I-1 presents the basic steps of the CFEA process. The major portion of the process consists of analytic procedures that specify and analyze missions and collective tasks. In addition, procedures for assessing criticality of missions and tasks are included so the output of the process will be critical missions and collective tasks. Each step of the CFEA process is described briefly below:

1. Specify unit mission. Here statements of a unit's objectives or purpose for existence are developed (e.g., rapid deployment). These statements usually reflect the capabilities of a unit's primary weapons or equipment systems. A short range air defense (SHORAD) battalion, for example, has a mission of providing low altitude air defense. Also, statements of other requirements imposed upon the unit can be developed.

2. Specify element missions. In this step the missions performed by each element or echelon of the unit as they support accomplishment of the unit mission are specified.

3. Assess mission criticality. Here unit and unit element missions specified in steps 1 and 2 are evaluated to determine which ones have an important influence on accomplishment of the unit's primary mission. Missions that do have an important influence on accomplishment of the unit's primary mission are deemed critical.

```
        Mission Analysis          Task Analysis
      ┌─────────────────┐      ┌─────────────────┐

      ┌──────────────┐          ┌──────────────┐
      │   Specify    │          │   Specify    │
      │    Unit      │          │  Collective  │
      │   Mission    │          │    Tasks     │
      └──────────────┘          └──────────────┘
             │                         │
             ▼                         ▼
      ┌──────────────┐          ┌──────────────┐
      │   Specify    │          │    Assess    │
      │   Element    │          │    Task      │
      │   Missions   │          │  Criticality │
      └──────────────┘          └──────────────┘
             │                         │
             ▼                         ▼
      ┌──────────────┐          ┌──────────────┐
      │    Assess    │          │   Analyze    │
      │   Mission    │          │   Critical   │
      │  Criticality │          │    Tasks     │
      └──────────────┘          └──────────────┘
```
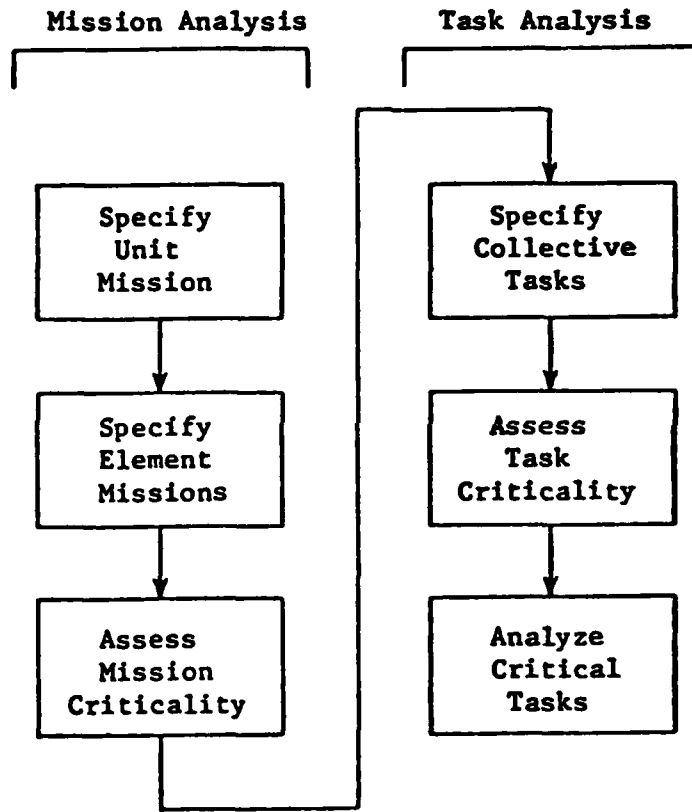
Figure I-1. Major Steps of Process

4. Specify collective tasks. For each unit element mission determined to be critical in step 3 the collective tasks that support that mission are specified in this step.

5. Assess task criticality. In this step tasks specified in step 4 are evaluated to determine which are critical. Task criticality is a function of the importance of a task to accomplishment of the mission it supports.

6. Analyze critical tasks. In this last step, tasks identified as critical in step 5 are analyzed to determine elements of performance, personnel who perform the task, and conditions and standards for performance.

Analytic procedures in the CFEA process employ a systems or 'top-down' approach to specifying the missions and tasks of a unit. Use of a systems approach to CFEA is advantageous for several reasons. First, logical links are established between the collective tasks, the unit element missions, and the unit mission. This facilitates development of mission oriented training because it is easy to determine the tasks that support a given mission. Also, activities specified at a general level such as missions provide a context within which to judge the relevance of more specific activities such as collective tasks. Thus, assessment of task or mission criticality is enhanced. Finally, the top-down approach used in systems analysis increases the likelihood that a complete and thorough set of collective tasks will be produced. Functional areas of the unit are broken down into increasingly smaller units for analysis (unit elements, collective tasks).

While the systems approach to CFEA offers several benefits the utility of the results of a given CFEA will depend upon the extent to which procedures in the process are followed explicitly. In an effort to make the process easier to perform each of the major steps presented in Figure I-1 has been broken down into smaller steps. The section that follows provides instructions in how to conduct each step in the process.

SECTION II

INSTRUCTIONS FOR PERFORMING CFEA

The expanded CFEA process is presented in Figure II-1. This model is considerably more detailed in its breakdown of activities than the basic model presented in Figure I-1. In the model activities are allocated to one of two categories, administrative and technical. Technical activities are those directly involved in specifying and analyzing missions and collective tasks. Administrative activities are activities involved in preparing to conduct a CFEA and managing and keeping records of the CFEA process. Inclusion of administrative activities is important because timely completion of a usable CFEA depends upon effective management and administration of the process.

Activities in the model can be organized into three major phases. These phases are preparation, the mission analysis, and the task analysis. The preparation phase consists of activities that must be performed prior to actually beginning the analysis. In the mission analysis phase the missions of the unit under study are specified and a criticality assessment is conducted to determine which are important to unit success. Finally, activities involved in specifying collective tasks, assessing criticality of those tasks, and analyzing the critical collective tasks are performed in the task analysis phase.

In the pages that follow instructions are provided for conducting each step of the CFEA process presented in Figure II-1. Presentation of instructions is organized in terms of the three phases of the process. Instructions are keyed to steps listed in Figure II-1.

Preparation Phase

Steps A1 through A3 are the activities involved in preparing to conduct a CFEA. In these activities the personnel that will conduct the CFEA are assembled, a plan for conducting the CFEA is prepared, and the materials needed to perform the CFEA are acquired.
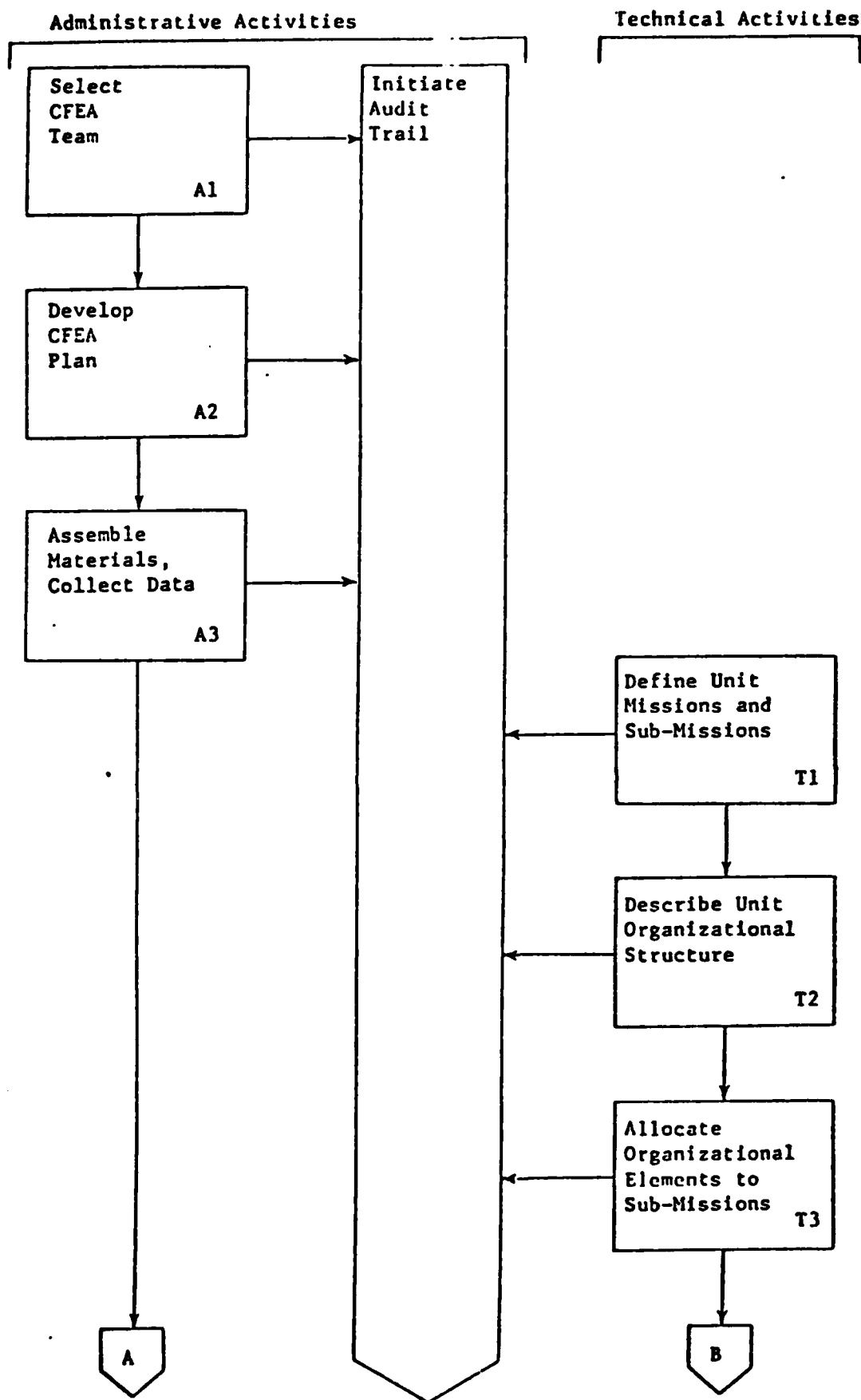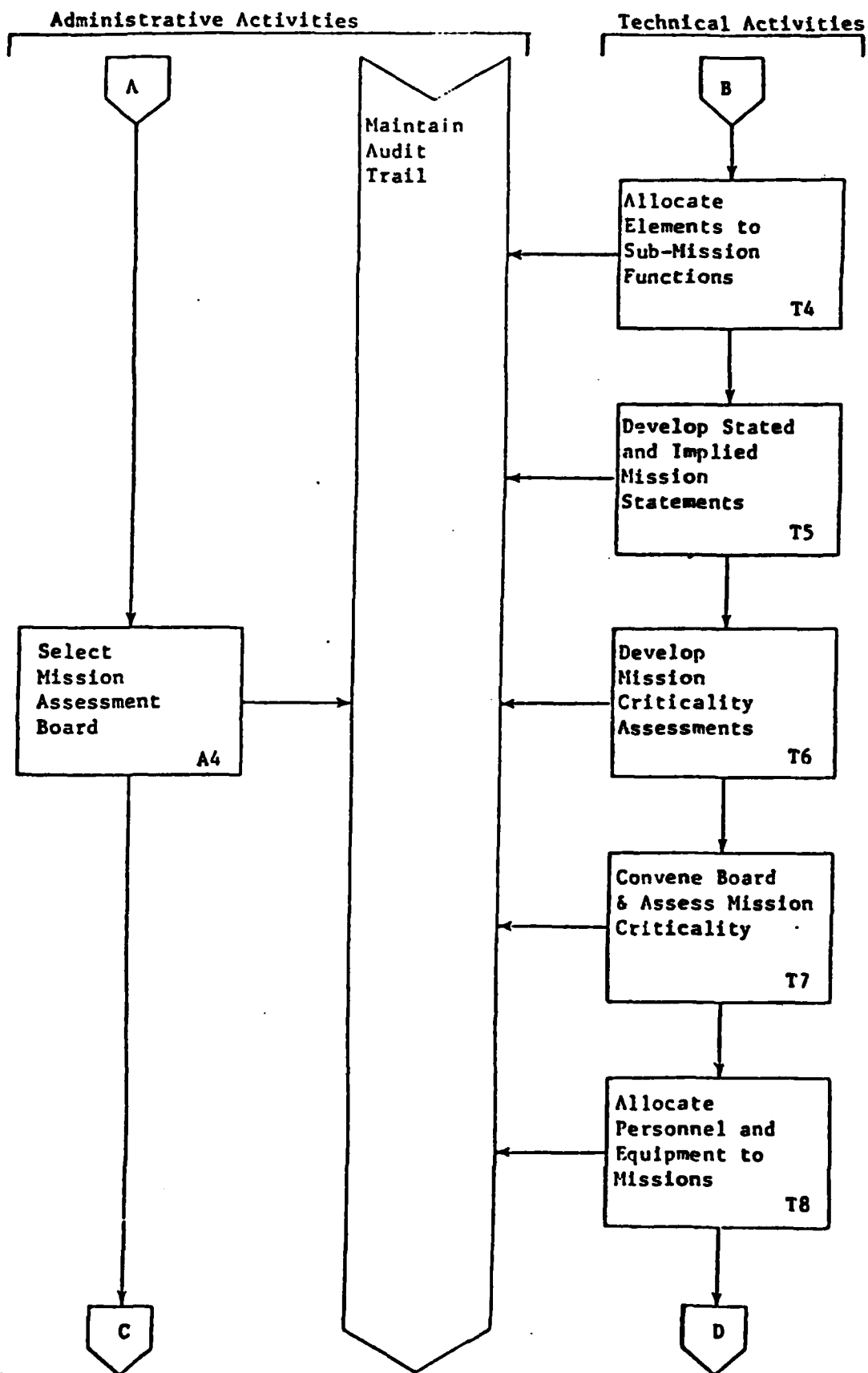
Figure II-1. Revised CFEA Model

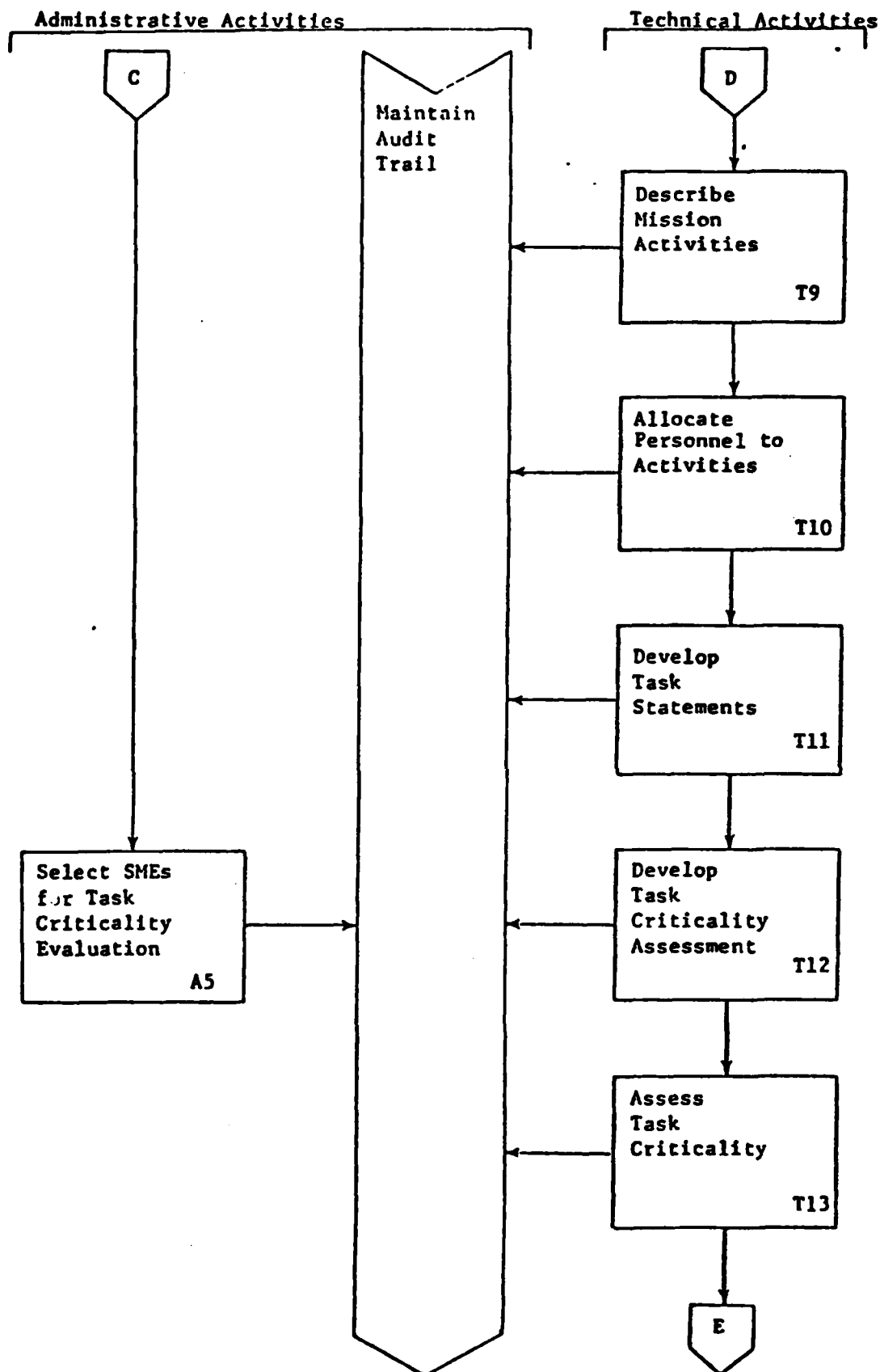Administrative Activities   Technical Activities

```
        ┌─A─┐                                          ┌─B─┐
        └─┬─┘          Maintain                        └─┬─┘
          │            Audit                             │
          │            Trail                             ▼
          │                                      ┌──────────────────┐
          │                                      │ Allocate         │
          │                                      │ Elements to      │
          │                                  ◄───│ Sub-Mission      │
          │                                      │ Functions        │
          │                                      │              T4  │
          │                                      └────────┬─────────┘
          │                                               ▼
          │                                      ┌──────────────────┐
          │                                      │ Develop Stated   │
          │                                      │ and Implied      │
          │                                  ◄───│ Mission          │
          │                                      │ Statements       │
          │                                      │              T5  │
          │                                      └────────┬─────────┘
          ▼                                               ▼
  ┌──────────────┐                             ┌──────────────────┐
  │ Select       │                             │ Develop          │
  │ Mission      │                             │ Mission          │
  │ Assessment   │────────►                ◄───│ Criticality      │
  │ Board        │                             │ Assessments      │
  │          A4  │                             │              T6  │
  └──────┬───────┘                             └────────┬─────────┘
         │                                               ▼
         │                                      ┌──────────────────┐
         │                                      │ Convene Board    │
         │                                      │ & Assess Mission │
         │                                  ◄───│ Criticality      │
         │                                      │              T7  │
         │                                      └────────┬─────────┘
         │                                               ▼
         │                                      ┌──────────────────┐
         │                                      │ Allocate         │
         │                                      │ Personnel and    │
         │                                  ◄───│ Equipment to     │
         │                                      │ Missions         │
         │                                      │              T8  │
         │                                      └────────┬─────────┘
         ▼                                               ▼
       ┌─C─┐                                           ┌─D─┐
       └───┘                                           └───┘
```

Figure II-1 (Cont'd)

C

Maintain
Audit
Trail

D

Describe
Mission
Activities

T9

Allocate
Personnel to
Activities

T10

Develop
Task
Statements

T11

Select SMEs
for Task
Criticality
Evaluation

A5

Develop
Task
Criticality
Assessment

T12

Assess
Task
Criticality

T13

E

Figure II-1(Cont'd)

Administrative Activities   Technical Activities

E

Develop
Task
Descriptions
T14

Maintain
Audit
Trail

Develop
Conditions and
Standards
T15

Verify/Validate
Task Analysis
T16

Publish
Products

Figure II-1(.Cont'd)

II-5

A1. Select CFEA Team. Once the decision to conduct a CFEA is made
the team that will perform the CFEA must be assembled. The project director
is assigned first. Then, ideally, the project director selects the team
members.

The primary consideration in selecting personnel is to provide a team
that possesses the broad range of skills and knowledge needed to perform
a CFEA. Successful conduct of a CFEA requires a knowledge of the training
development process in general and the CFEA process in particular in order
to understand the purpose of a CFEA. Also required is an extensive knowledge
of all aspects of the operations of the unit under study. These two sets of
knowledge are rately possessed by each member of the team so ability to
communicate information and ideas is another important characteristic of
team members. Other not so obvious skills and abilities such as familiarity
with literature pertinent to the CFEA and experience in conducting literature
searches are valuable also.

Another consideration in selecting the CFEA team is the number of
personnel needed. CFEA is a labor intensive effort and generally requires
a large staff. The number of personnel required for a given CFEA will be
dependent upon factors such as the proposed scope of the CFEA and the time
allotted to perform it. These factors are generally specified in the CFEA
plan. Therefore, the project director might wish to delay selecting all
team members until the CFEA plan is complete. A small core of key personnel
can be selected first so the plan can be prepared. Once the plan is com-
pleted, additional personnel can be selected as needed.

Some basic guidelines for selecting personnel are presented below.

1. Determining the Number of Personnel Needed. A CFEA is
a labor intensive effort. For planning purposes use a
figure of eight professional staff years (PSY) as the level
of effort required to conduct a complete CFEA. To get
an estimate of the number of personnel required for a
CFEA team, divide the amount of time (in terms of years)
allotted for conducting the CFEA into the 8 PSY figure.
If, for example, nine months are allotted to conduct a
CFEA, then approximately 10 people are needed for the CFEA
team (8 PSY ÷ .75 years = 10 PSY).

2. Mix of Staff Capabilities. While an understanding of front-end analysis and training development procedures is a desirable characteristic of project staff, primary emphasis should be given to acquiring personnel with experience in the unit to be studied. The majority of the work performed in the CFEA will be performed by the personnel who are subject matter experts (SMEs) in unit operations. Personnel with an understanding of front-end analysis and training development procedures are needed to guide and direct the activities of team SMEs, however, only one or two of these personnel are really needed. The main concern here is insuring that someone with an understanding of the analysis process is always available to help the unit operations SMEs. Of course, if personnel can be obtained that have experience in both unit operations and training development, so much the better.

3. Selection of Personnel. In selecting personnel two factors are given primary consideration: experience and communication skills. The objective in selecting team members is to acquire personnel with a broad range of pertinent experience and good communication skills. Experience is the critical factor. A good rule of thumb for selecting unit operations SMEs is five or more years experience in the unit to be studied. Also, the experience should have been relatively recent. The SMEs should not have been away from the unit environment more than one year. If they have been away from the unit for more than a year they should have been in a position to keep current on things like product improvement programs (PIPs) and changes in doctrine of employment of the unit. Generally, SMEs should be or have been an NCO, Warrant Officer, or Commissioned Officer of rank of Captain or above.

There are several areas of experience within a unit that must be considered in selecting SMEs. These areas are employment of the primary weapons or equipment system of the unit, unit operations (e.g., S-3 functions), and support services (e.g., Admin, Supply, Motors, etc.). Often, SMEs can be found that have experience in several of these areas. Typically, more emphasis is placed on acquiring SMEs with experience in employment of the primary weapons or equipment system of a unit and unit operations. This is particularly true now that common modules are becoming available for unit elements involved in unit support.

Personnel who provide guidance in use of the analysis procedures should have several years experience in training development projects. Usually these personnel are drawn from military technical schools. They should have participated in at least one large (e.g., 6 PSY) training development effort.

The most desirable way to assess the experience of a prospective SME is to talk to him/her. A formal interview can be developed if so desired. In the course of the interview you should ask the candidate to specify any formal training they have received that is pertinent to operation of the unit to be studied (e.g., MOS training, special schools, etc.) or the analysis to be conducted (e.g., training in Instructional Systems Development). Also, you should have the candidate list the different job positions that he/she has held in the unit of interest and state how long those positions were held.

In interviews with personnel who will guide the analysis the focus should be on their knowledge of the training development process and the types of projects with which they have been involved. They should demonstrate a basic understanding of the instructional system development (ISD) process and a familiarity with the terminology of ISD. In addition they should have been involved in at least one major ISD effort and, hopefully, held a leadership position in that effort.

Interviews provide an ideal means of assessing a candidate's communications skills. In a CFEA there is much information exchanged among team members as they specify and analyze missions and tasks. Thus ability to communicate is an important characteristic of team members. In the interview note how clearly and succinctly the candidate presents information and ideas. If possible get a sample of material the candidate has written to get an indication of writing ability.

Initiate Audit Trail. Throughout conduct of a CFEA an audit trail is maintained which provides a record of the activities performed in each step of the process. Beginning with the completion of Step A1 and at the conclusion of all remaining steps in the process copies of products generated and/or decisions made are entered into the audit trail along with a description of the rationale and procedures underlying those activities. Thus, the audit trail provides a means of tracing back through the CFEA to determine how and why the different outputs were generated.

A2. Develop CFEA Plan. A project the size of a CFEA requires considerable planning if it is to be conducted successfully. Once assembled, the CFEA team must formulate a plan which specifies the objectives of the CFEA, any constraints on the analysis, and project milestones for accomplishment of major portions of the CFEA.

Developing Objectives of the Analysis

Statements of the objectives of the analysis should indicate why the CFEA is being performed and how the products of analysis will be used. It is important to indicate why a CFEA is being performed because the circumstances giving rise to the analysis affect its scope. There are a number of situations that can prompt conduct of a CFEA. Chief among these are product improvement changes to unit equipment systems, fielding of a new weapons and equipment system, and problems with existing training materials.

Product improvement programs (PIPs) often result in changes in the capabilities of the major equipment or weapons systems of a unit. Such programs may be accompanied by changes in the configuration of the unit or the doctrine for its employment. In such instances a CFEA should be conducted to determine how the change impacts missions and tasks performed in a unit. A CFEA based on a system PIP is generally limited in scope and deals with those unit elements directly affected by the PIP.

When a new equipment system is being fielded a CFEA must be performed to establish the collective training requirements for the new system. Generally, the structure of units employing the new system is based on the structure of units that employed earlier generations of the new system (e.g., the structure of M-1 tank battalions is similar to M60-1A battalions). Thus, a CFEA of units employing new equipment systems is somewhat like a CFEA of a system that has undergone a PIP. The objective of the CFEA is to identify the elements of the unit that are affected by implementation of the new system and determine how the missions and tasks of those elements are changed by the new system.

Another situation prompting conduct of a CFEA is deficiencies in existing collective training materials. Inevitably, errors are found in training materials as they are put into use. If an ARTEP or drills developed for a unit are found to be deficient in terms of an incomplete listing of missions and tasks, errors in descriptions of performances or personnel specified as performing tasks, and/or poorly stated or invalid standards a CFEA might be conducted to correct these deficiencies. The scope of the CFEA will depend

on how extensive the errors are. If the errors are isolated to the missions
and tasks of a few selected unit elements, the analysis will be restricted
to those elements. If, however, the training materials for most elements
of the unit have errors, an analysis will be conducted for the entire unit.

Specifying how products of a CFEA are to be used is important because
it influences the manner in which different steps in the process are per-
formed. If the objective of a CFEA is just to produce an ARTEP, much atten-
tion will be given to specifying the missions and tasks of a unit but a
detailed analysis of tasks such as is performed to develop a drill will
not be conducted. Instead, tasks will be analyzed just enough to specify
the major elements of performance and develop conditions and standards.

Generally, statements of the objectives of a CFEA can be developed
from the tasking statement prepared by the group or organization that ini-
tiates the CFEA. Part of the tasking statement should include a description
of the problem that prompts the study. The objectives statement can be
developed from the problem statement. Figure II-2 provides an example of
development of a CFEA objective from a problem description. Note that the
example CFEA objective states how the products of the analysis will be used
and why the analysis is being performed.

Specifying Constraints

Constraints are any limitations or restrictions placed on the analysis.
They can be imposed upon the analysis as part of the initial tasking or by the
CFEA team. An example of a constraint is the type of environment considered
in specifying the missions and tasks of a unit. Different environments
affect the types of missions and tasks performed by a unit or the manner
in which those missions and tasks are performed. In the European environment,
for example, considerable emphasis is placed on the ability of a unit to
operate in a nuclear, biological, or chemical (NBC) environment.

II-11

Sample Problem Statement #1

Recent product improvements in the Chaparral weapons system have greatly increased system capabilities, particularly with regard to nightime and forward hemisphere engagement capabilities. These improvements have had an impact on the performance requirements of Chaparral crews and to some extent have affected how the system is employed (e.g., design of defense). A collective front-end analysis (CFEA) is needed to determine how the missions and tasks of Chaparral units have been affected by these changes. The CFEA will provide input to modification of the ARTEP for Chaparral units and to revision of drills for Chaparral crews.

Resulting CFEA Objectives

The objective of the Chaparral CFEA is to enable modification and revision of the Chaparral ARTEP and drills by specifying how product improvement modifications to the Chaparral system have changed the mission and task requirements of Chaparral units.

Figure II-2. Example of a CFEA Objective Derived from a Problem Statement

Another common constraint is a restriction on the unit elements studied. In a recent CFEA of HAWK units a constraint placed on the analysis was that HAWK Maintenance Batteries and Platoons not be addressed in the analysis. This constraint was imposed because another organization was conducting a CFEA of these elements. Sometimes a CFEA team might decide to restrict the unit elements analyzed because of time or other resource limitations.

Establish Milestones

A CFEA's objectives and constraints all set bounds on the analysis and determine its scope. Once these bounds have been established you will have a good idea for how much of a unit needs to be analyzed and how detailed the analysis should be. At this point, milestones should be set for major portions of the project (e.g., when specification of missions should be complete, when the mission analysis should be complete, when task analysis should be complete, etc.). Milestones are important because they provide project staff with goals to work toward and points where progress of the effort can be evaluated. Milestones would be developed by jointly considering the amount of work to be done, the number of personnel available to do the work and the time allotted to the entire project. Examples of milestone charts are presented in Figures II-3 and II-4. Figure II-3 presents milestones set for the mission analysis portion of a CFEA of the HAWK system. Milestones of the task analysis portion of the HAWK CFEA are presented in Figure II-4. Note that considerably more time was programmed for the task analysis. Some general rules of thumb for setting milestones are as follows:

1. A complete mission analysis of a HAWK battalion was done in three months with six person months.

2. It takes about three times as long to specify and analyze tasks as it does to specify missions.
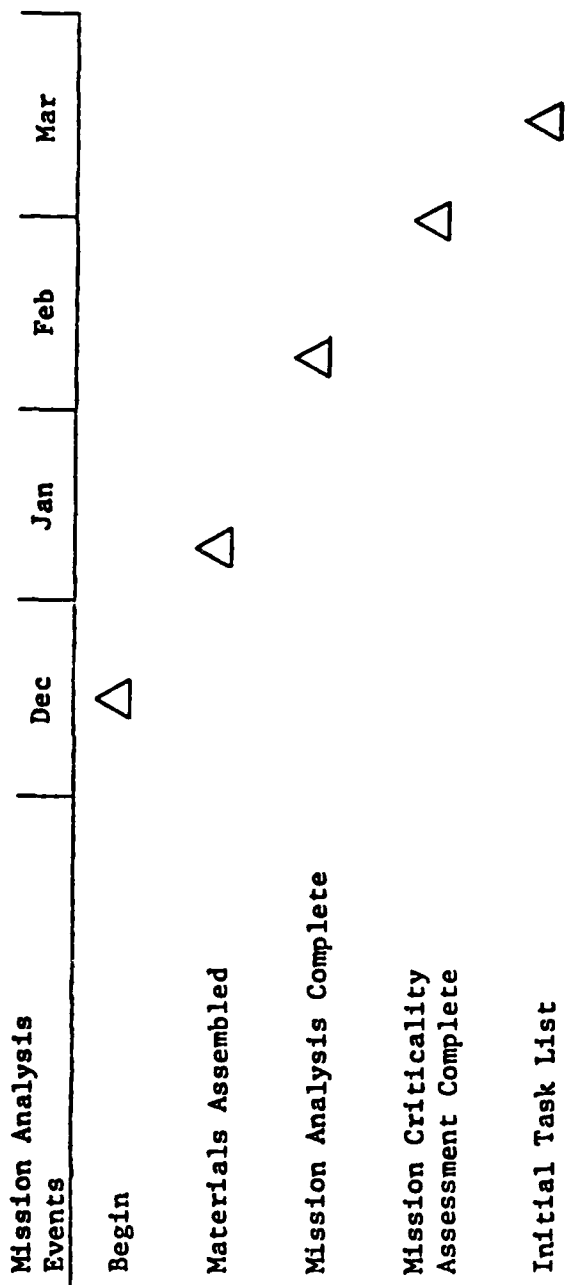
Mission Analysis Events	Dec	Jan	Feb	Mar
Begin	△			
Materials Assembled		△		
Mission Analysis Complete			△	
Mission Criticality Assessment Complete			△	
Initial Task List				△

Figure II-3. Milestones for Mission Analysis

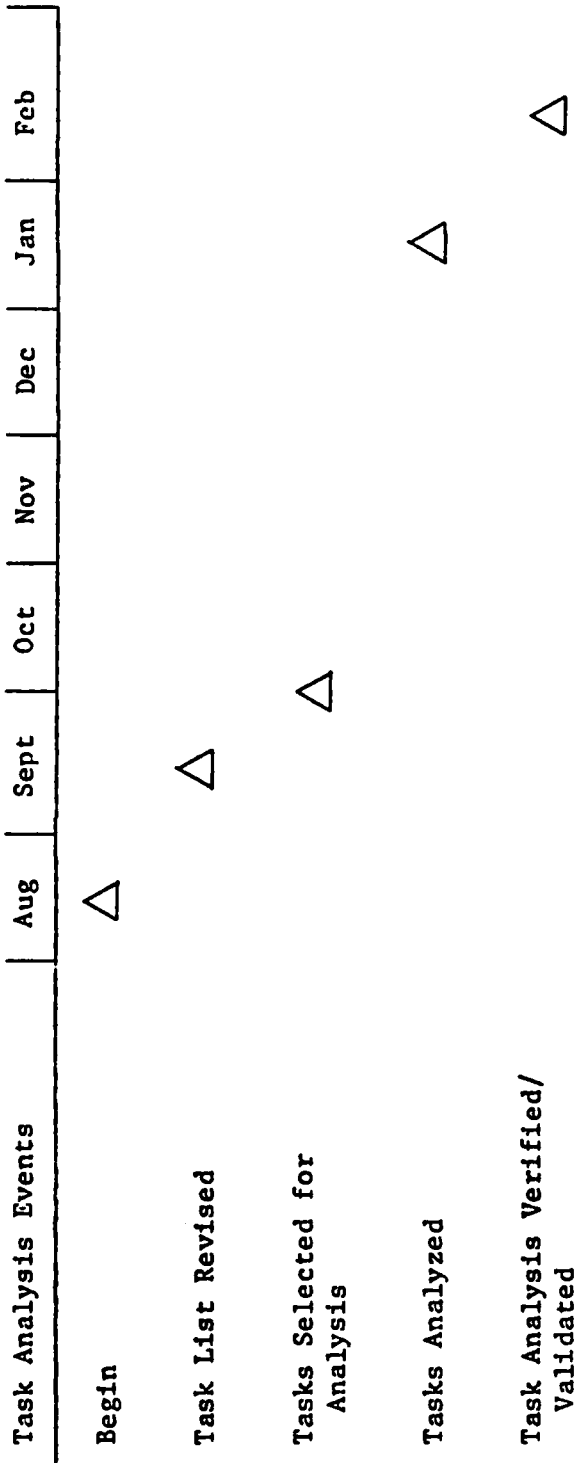| Task Analysis Events	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Begin	△						
Task List Revised		△					
Tasks Selected for Analysis			△				
Tasks Analyzed						△	
Task Analysis Verified/ Validated							△

Figure II-4. Milestones for Task Analysis

II-15

A3. Assemble Materials, Collect Data. In this step the CFEA team gathers the materials needed to support performance of the CFEA. Typically, these materials will consist of documentation relevant to the unit under study and Army literature pertinent to conduct of CFEA. The materials should be organized and cataloged as they are collected. At the conclusion of this step the team will have a readily available library containing much of the information they need to perform the CFEA. Development of a library is important because it enables the analysis to proceed more smoothly and efficiently. The analysis will not be continually interrupted by the need to obtain materials relevant to some issue or question.

Primarily, four different types of documents are sought in developing the library:

1. Doctrinal literature related to employment of the unit under study.

2. Tables of organization and equipment (TO&Es) that specify the composition and structure of the unit under study and describe the responsibilities of the various unit elements.

3. Literature describing operation and repair of equipment used in the unit of interest and the responsibilities and tasks of battalion personnel.

4. Literature pertaining to conduct of front-end analysis. Of primary interest here are Army regulations and pamphlets concerning front-end analysis and training development activities. Chief among these are:

    a. AR 350-1, Army Training.

    b. AR 350-2 with TRADOC Supplement, Opposing Force (OPFOR) Program .

    c. TRADOC Regulation 310-2, Development, Preparation and Management Army Training and Evaluation Program (ARTEP).

    d. TRADOC Regulation 350-7, Systems Approach to Training (SAT).

    e. TRADOC Regulation 351-4, Job and Task Analysis.

f. TRADOC Regulation 381-1, Threat Development.

g. TRADOC Circular 351-8, Individual and Collective Training Plan for Developing Systems Policy and Procedures.

h. TRADOC Circular 351-28, Soldier's Manuals, Commander's Manuals, and Job Book Policy and Procedures.

i. TRADOC Pamphlet 350-30, Interservice Procedures for Instructional Systems Development.

j. TRADOC Pamphlet 351-4(T), Job and Task Analysis Handbook.

k. TRADOC Pamphlet 310-8.

Mission Analysis Phase

The mission analysis encompasses steps T1 through T7 of the CFEA model. The mission analysis begins by describing the mission(s) of the unit under study. Generally, a battalion will be the type of unit submitted to analysis. Battalions are often organized around major equipment or weapons systems. Thus, the objective in specifying unit missions usually becomes one of describing the various ways in which a unit employs its weapon or equipment systems. In addition, other requirements (e.g., peacetime duties such as disaster relief) imposed upon a unit might be specified as unit missions also.

Once the unit missions have been described missions performed by unit elements are specified. In specifying unit element missions the objective is to describe what each unit element does to support accomplishment of the unit missions. It can be expected that there are a large number of unit element missions in a battalion. In attempting to list these missions there is a good chance that important missions will be overlooked.

In the CFEA model the process for specifying unit missions has been broken down into several steps. Also, some aids have been developed that help organize information used in developing unit missions and that prompt development of

mission statements. Matrices are used to organize information. A list of generic functions that describe the different types of activities performed in a unit are used to prompt development of mission statements. In combination these features of the CFEA process help insure preparation of a thorough list of unit element missions.

The mission analysis phase concludes with an assessment of mission criticality. Basically, the objective of the criticality assessment is to determine which missions merit training. Those missions deemed critical are analyzed in the task analysis phase to determine the tasks that support them. Non-critical missions are dropped from consideration.

Dropping non-critical missions from the analysis serves several purposes. Ultimately, it insures that non-critical missions are not included in unit training materials such as ARTEPs and that, consequently, unit training resources are not expended on missions with little contribution to unit success. In addition, dropping non-critical missions also saves CFEA and training development resources. Thus, time is spent only on deriving tasks performed under critical missions and developing training materials for initial tasks.

The criticality assessment is performed for both unit and unit element missions. Essentially, the mission criticality assessment requires that the CFEA team specify the characteristics of critical missions, devise a means of collecting data on the extent to which each mission exhibits those characteristics, and then analyze the data to identify those missions that are critical and those that are non-critical. In the CFEA model an approach to assessment of mission criticality is offered that involves collecting ratings of mission criticality from subject matter experts (SMEs). Also, sets of factors and criteria for evaluating unit missions and sub-missions are suggested. Some latitude is provided in development of the criticality assessment, because it is recognized that a CFEA team might wish to tailor the assessment to the particular objectives and information needs of their CFEA.

Each of the steps involved in the mission analysis is described below.

T1. Define Unit Missions and Sub-Missions. The first step involved in actual conduct of a CFEA consists of defining the missions and sub-missions of the unit under study. Unit missions are really descriptions of the goals or objectives of the unit. Typically, unit missions statements are developed with reference to the objectives or capabilities of the primary weapon or equipment system(s) employed by the unit and the doctrine of employment of the unit. A HAWK battalion, for example, has the mission of providing low to medium altitude air defense. This mission reflects the function and capabilities of its primary weapon system, the HAWK system. Such missions are referred to as primary missions.

Sometimes a unit is given other, additional missions that are not directly involved in employment of their major equipment and weapon systems. These are called secondary missions. Secondary missions are required for one of several reasons. First, a secondary mission might enable the battalion to perform its primary mission. Redeployment missions, for example, are often given to units stationed in the continental United States (CONUS) so they can be prepared to move quickly and efficiently to a combat zone and arrive prepared to perform their primary mission. Another type of secondary mission is a requirement placed on a battalion which has nothing to do with the battalion's primary mission but is imposed because the battalion provides an organized, disciplined pool of manpower. An example of such a mission is providing relief and assistance during disasters.

Once unit missions have been specified the primary missions should be broken down into sub-missions. They can take several forms. Sub-missions can be statements of the major groups of operations a unit must perform to accomplish its mission. Sub-missions of this type for a HAWK battalion's primary mission of providing low to medium altitude air defense are conduct the air battle, sustain operations, and survive on the battlefield. Another class of sub-mission statement is descriptions of specific tactical missions that the unit might be required to perform. Examples of tactical missions for a HAWK battalion are to provide low to medium altitude air defense for a maneuver element and to provide low to medium altitude air defense for a division asset. Both types of sub-missions should be specified.

II-19

Use of sub-missions can be helpful for several reasons. First, breaking a primary mission into groups of operations such as conduct air battle, sustain operations, and survive on the battlefield helps to define the different types of missions that unit elements must perform to support the primary mission. This makes it easier to specify unit element missions. Also, development of tactical sub-missions can lead to better mission oriented training. Tactical sub-missions provide precise statements of the jobs a unit might be called upon to perform. Thus, it is possible to determine the unit element missions and the tasks that most directly support a tactical sub-mission and train them in the context of that sub-mission.

Specification of unit missions and sub-missions is accomplished through review of literature related to unit employment and interviews with SMEs familiar with the unit. Field Manuals (FMs) on unit employment provide the best source of primary missions and tactical sub-missions. Usually specific statements of these missions can be obtained directly from the FMs. Secondary missions are more difficult to find. A good way to develop secondary missions is to review the standard operating procedures (SOPs) of different units of the type under study. You will find missions such as rapid and strategic deployment in SOPs. SMEs on the CFEA team should also be able to develop secondary missions by recalling their experience in the units under study. Finally, specification of sub-missions that are groups of operations performed in a unit mission is left to the discretion of the CFEA team. Basically, activities performed in a unit mission fall into three categories:

1. Combat operations: activities directly involved in employment of the unit's primary weapons and equipment systems.
2. Support: activities that enable the unit to sustain operations.
3. Survival: activities that enable the unit to survive on the battlefield (e.g., nuclear, biological, and chemical (NBC) defense).

These three categories should be used in developing sub-missions. How the categories are titled is left up to the CFEA team.

II-20

T2. Describe Unit Organizational Structure. The objective of this step is to specify the various organizational elements of the unit and determine the relationship between elements. This is the first step to specifying the missions performed by unit elements. The output of this step is an organizational diagram that depicts the relationship between elements. This diagram is useful because it allows for quick determination of which elements support the activities of other elements. The description of a unit's structure is developed using the Table of Organization and Equipment (TO&E) for the unit. In fact, an organizational diagram can usually be obtained directly from the unit's TO&E. By way of example, an organizational diagram of a HAWK battalion is presented in Figure II-5.

T3. Allocate Organizational Elements to Sub-Missions. In this step unit elements specified in step T2 are allocated to sub-missions specified in step T1. As described in step T1 a unit mission can be broken down into sub-missions that describe the major groups of operations performed in the mission (e.g., the HAWK mission of provide low to medium altitude was broken down into sub-missions of conduct the air battle, sustain operations, and survive on the battlefield). It was noted that use of such sub-missions is helpful because it indicates the types of missions unit elements must perform to support accomplishment of the unit mission. Thus, grouping unit elements in terms of sub-missions aids specification of unit element missions because it gives an indication of kinds of missions an element performs.

Grouping of elements by sub-missions is accomplished through use of a matrix with rows composed of battalion elements and columns composed of sub-missions. X's are placed in the cells of the matrix to indicate which elements participate in which sub-missions. As an example, the matrix used to allocate HAWK battalion elements to HAWK sub-missions is presented in Figure II-6. Referring to Figure II-6 note that elements can be involved in more than one sub-mission. The Fire Distribution Section (FDC), for example, is involved in the air battle and sustaining operations. While its chief responsibility is to control the fires of battalion fire units (participation in the air battle), FDC personnel also perform organizational level maintenance on its primary equipment system the AN/TSQ-73 (participation in sustaining operations). Referring again to Figure II-6 note also that all elements are involved in the sub-mission 'survive on the battlefield'.

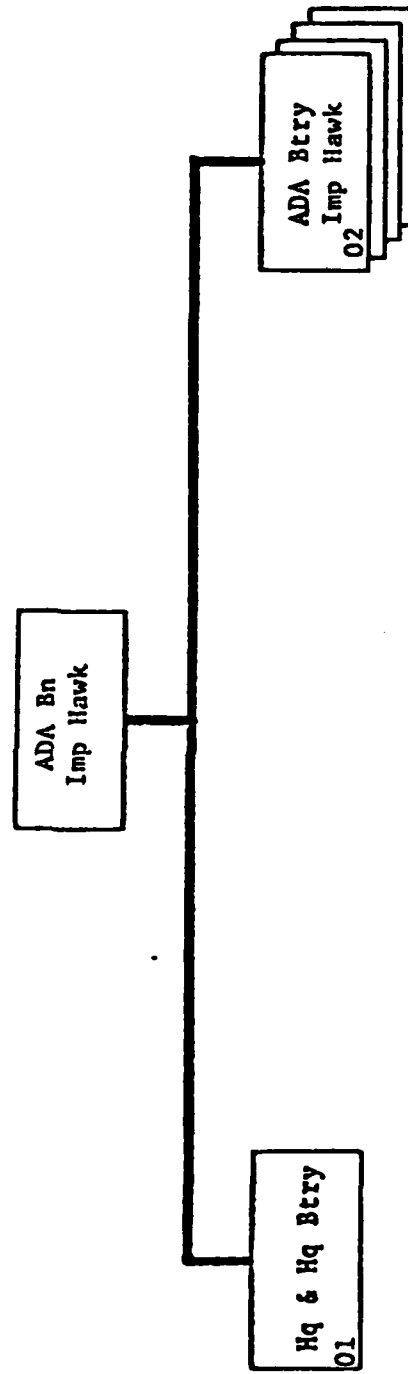AIR DEFENSE ARTILLERY BATTALION
IMPROVED HAWK

Figure II-5. Organizational Structure of HAWK Battalion

HEADQUARTERS AND HEADQUARTERS BATTERY
AIR DEFENSE ARTILLERY BATTALION, IMPROVED HAWK

Hq & Hq Btry

Bn Hq — 01

Hq Btry

Mtr Maint Sec — 08

Trans Sec — 20

Btry Hq — 02

Med Sec — 10

Bn Sup Sec — 09

Mchan Comm Sec — 07

Scty Sec — 14

Comm Plt

Comm Cen Sec — 06

Elct Sec — 13

Com Plt Hq — 05

FD Sec — 12

Op-Scty

Rdr Sec — 11

Admin Sec — 03

Op-Intel Sec — 04

*When organized under SRC 44246H210,
Change 11 deletes paragraphs 15, 16, 17, 18 and 19.

Figure II-5. (Cont'd)

AIR DEFENSE ARTILLERY BATTERY, IMPROVED HAWK

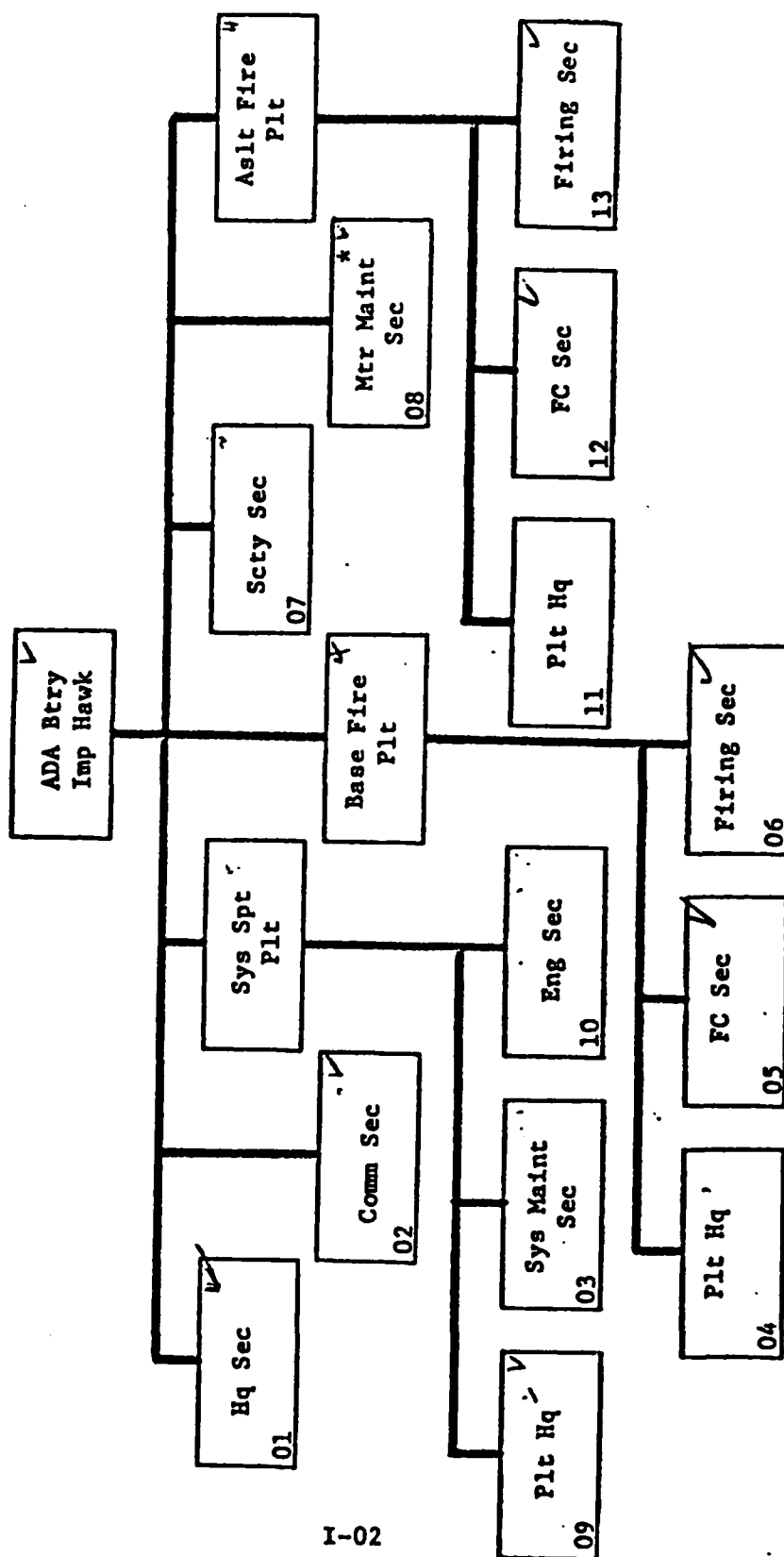| ADA Btry Imp Hawk	

Hq Sec	01

Comm Sec	02

Sys Spt Plt	

Sys Maint Sec	03

Plt Hq	04

FC Sec	05

Eng Sec	10

Firing Sec	06

Plt Hq	09

Base Fire Plt	

Scty Sec	07

Mtr Maint Sec*	08

Aslt Fire Plt	

Plt Hq	11

FC Sec	12

Firing Sec	13

*When organized under SRC 44247H220, Change 11 adds paragraphs 09, 10, 11, 12, and 13.

Figure [I-5.(Cont'd)

I-02

	Conduct Air Battle	Sustain Operations	Survive on the Battlefield
HQ BTRY Elements			
- HQ		X	X
- S-1		X	X
- S-2/S-3	X	X	X
- Fire Distribution Sec.	X	X	X
- Radar Sec.	X	X	X
- Bn Electronics Sec.	X	X	X
- Bn COMMO PLT	X	X	X
- S-4		X	X
- Bn Medical Sec.		X	X
- Bn Transportation Sec.		X	X
- HQ BTRY Motor Maint.		X	X
- HQ BTRY Security Sec.			X
Firing BTRY Elements			
- FB HQ	X	X	X
- FB COMMO Sec.	X	X	X
- FB System Maint. Sec.	X	X	X
- FB Base PLT	X		X
- FB Assault PLT	X		X
- FB Motor Maint Sec.		X	X
- FB Engineer Sec.		X	X
- FB Security Sec.			X

Figure II-6.   Battalion Element by Sub-Mission Matrix
From HAWK CFEA

II-25

To allocate unit elements to sub-mission, first develop a matrix like
the one presented in Figure II-6 except enter the elements of the unit of
interest in your study in the rows of the matrix and the sub-missions you
developed in step T1 in the columns. Then, using input from SMEs on the
CFEA team and the TO&E of the unit, assign unit elements to the sub-missions.
A good way to conduct the assignment process is to have the CFEA team go
through the matrix as a group. The TO&E is used as the primary source for
making assignments because it generally provides a good description of the
responsibilities of unit elements. Sometimes, however, TO&Es are not
thorough in their delineation of element responsibilities. Working as a
group the SMEs on the team will be able to recognize oversights in the TO&E
and fill in the missing information.

T4. Allocate Elements to Sub-Mission Functions. The objective of
this step is to determine which of an extensive list of sub-mission func-
tions are performed by each unit element. Sub-mission functions are the
different types of activities that are performed in a sub-mission. As an
example, some of the sub-mission functions of the HAWK sub-mission sustain
operations are service, repair, rearm and refuel. Sub-mission functions are
a helpful aid for specifying unit element missions because they provide cues
for the recall and development of those missions. Their use can result in
a more thorough listing of missions.

As with allocation of elements to sub-missions, matrices are used in
allocation of elements to sub-mission functions. For each sub-mission used
in step T3, a matrix is developed. The columns of the matrix are formed by
the functions relevant to that sub-mission. The rows are formed by the unit
elements that were identified in step T3 as participating in that sub-mission.
As an example, the matrices used in the HAWK CFEA to allocate HAWK battalion
elements to sub-mission functions are presented in Figure II-7. To help you
develop the matrices you will use to allocate elements to sub-mission functions,
a list of functions for the different categories of sub-missions is provided
in Table II-1. The list is not intended to be exhaustive. It was developed
with air defense units in mind. For other types of units some of the functions
on the list might be inappropriate, other functions might need to be added.
It does, however, provide a CFEA team with a good start towards developing
their own function list.

Air Battle Functions

Battalion Element	Gather/Analyze Information	Plan	Coordinate	Control/Direct	Acquire	Engage	Communicate	Emplace
HQ BTRY Elements								
S-2/S-3	X	X	X	X				
Fire Distribution Sec.			X	X	X		X	X
Radar Sec				X	X			X
Bn Electronics Sec.								X
Bn COMMO PLT							X	X
Firing BTRY Elements								
FB HQ		X	X	X			X	
FB COMMO Sec.								X
FB System Maint. Sec.								X
FB Base PLT			X	X	X	X		X
FB Assault PLT			X		X	X		X

Figure II-7. Battalion Element by Mission Function Matrix from HAWK CFEA

II-27

Sustain Operations

Element	Rearm	Refuel	Service	Repair	Feed	Clothe/Equip Personnel	Transport	Recordkeeping/Admin	Medical Services	Morale Support	Safety	Construct	Financial Accounting	Train	Store	Distribute	Security	Sanitation	Electrical Power	Recover Equipment/Materials
HQ BTRY Elements																				
HQ					X	X		X		X					X	X		X		
S-1								X		X	X			X						
S-2/S-3														X			X			
Fire Distribution Sec.														X						
Radar Sec.			X	X																
Bn Electronics Sec.			X	X																
Bn COMMO PLT			X	X																
S-4	X	X				X	X	X				X	X	X	X	X				
Bn Medical Sec.									X					X				X		
Bn Transportation Sec.	X	X					X									X				
HQ BTRY Motor Maint	X	X	X		X			X		X				X				X	X	X
Firing BTRY Elements																				
FB HQ																				
FB COMMO Sec.																				
FB System Maint Sec.			X	X				X							X					
FB Motor Maint Sec.		X	X	X				X						X					X	X
FB Engineer Sec			X	X				X						X					X	

Figure II-7 (Cont'd)

Element	NBC Ops	Ground Defense	Small Arms AD/MANPADS	RSOP	Bomb Disposal	Firefighting	Dental	Convoys	OPSEC	COMSEC	Fire Support	Evacuation	Refugee Care	POWs
HQ BTRY Elements														
HQ	X	X	X	X	X	X	X	X				X	X	X
S-2	X		X				X							X
S-2/S-3			X	X			X	X	X		X			X
Fire Distribution Sec.			X				X							
Radar Sec.			X				X							
Bn Electronics Sec.			X				X							
Bn COMMO PLT			X				X			X				
S-4			X				X							
Bn Medical Sec.			X				X							
Bn Transportation Sec.			X				X	X				X	X	
HQ BTRY Motor Maint			X				X	X						
HQ BTRY Security Sec.		X	X				X	X						
Firing BTRY Elements														
FB HQ	X	X	X	X	X	X	X	X	X	X	X	X	X	
FB COMMO Sec.			X				X							
FB System Maint. Sec.			X	X			X		X					
FB Base PLT			X	X			X	X	X					
FB Assault PLT			X				X	X						
FB Motor Maint Sec.			X				X	X						
FB Engineer Sec.			X				X							
FB Security Sec.		X	X				X	X						

HQ BTRY Elements
- HQ
- S-2
- S-2/S-3
- Fire Distribution Sec.
- Radar Sec.
- Bn Electronics Sec.
- Bn COMMO PLT
- S-4
- Bn Medical Sec.
- Bn Transportation Sec.
- HQ BTRY Motor Maint
- HQ BTRY Security Sec.

Firing BTRY Elements
- FB HQ
- FB COMMO Sec.
- FB System Maint. Sec.
- FB Base PLT
- FB Assault PLT
- FB Motor Maint Sec.
- FB Engineer Sec.
- FB Security Sec.

Figure II-7 (Cont'd)

Table II-1
List of Functions by Sub-Mission Categories

Combat Operations	Support	Survival
Gather/Analyze Information	Rearm	NBC Operations
Plan	Refuel	Ground Defense
Coordinate	Service	Small Arms Air Defense/MANPADS
Control/Direct	Repair	RSOP
Acquire	Feed	Denial
Engage	Clothe/Equip Personnel	Convoys
Communicate	Transport	OPSEC
Emplace	Recordkeeping/ Administration	COMSEC
Maneuver	Medical SErvices	Fire Support
	Morale Support	Evacuation
	Safety	Bomb Disposal
	Construct	Firefighting
	Financial Accounting	POWs
	Store	Refugee Care
	Distribute	
	Security	
	Sanitation	
	Electrical Power	
	Recover Equipment/Materials	
	Train	

Allocation of elements to sub-mission functions is performed like allocation of elements to sub-missions. As a group the CFEA team studies the TO&E of the unit and with the help of SMEs on the team enters X's in the cells of the matrix to indicate which elements perform which functions. In allocating elements to functions it is helpful to remember that TO&Es often overlook two functions performed by element. The first function is training. Often elements of a unit have the responsibility of training their own personnel or training personnel in other elements. In some units, for example, the Battalion Commo Platoon is responsible for training all of the Commo Sections in the battalion. The other function that is often over-looked is serving of an element's organic equipment. The Fire Direction Center of a HAWK battalion has as its primary function control of the air battle. However, its personnel also perform some basic service on the radar and command and control system used to control the air battle.

T5. Develop Stated and Implied Mission. Based on the sub-mission functions assigned to elements in the preceding step, mission statements are developed for each unit element in this step. Unit element mission statements are descriptions of the specific responsibilities of a unit element with respect to a particular function. In a HAWK battalion, for example, a number of elements perform service and repair functions. The missions of these ele-ments, however, differ in terms of the equipment upon which those service and repair functions are performed. The motor maintenance section performs service and repair on unit vehicles, trailers, and generators. A system support platoon performs service and repair functions on the HAWK system. Thus, the objective of this step is to specify exactly what an element does as it performs a particular function.

Two types of battalion element missions are specified: stated missions and implied missions. Stated missions were those listed in documentation on organization and employment of HAWK units. Implied missions are requirements imposed on an element that have not been stated explicitly. As indicated before, many elements have the implied mission of training their personnel. Team SMEs develop the implied missions.

Development of the missions of a unit element is accomplished as follows:

1. For a given unit element the functions allocated to it in the battalion element-sub-mission function matrices are noted. In Figure II-7, for example, the functions allocated to the Fire Distribution Section were coordinate, control/direct, acquire, communicate, emplace, service, repair, train, RSOP, and denial.

2. Next, a small group of CFEA team members, knowledgeable of the unit element under consideration review the TO&E paragraph for that element. As the paragraph is reviewed the group determines which of the functions allocated to the element are encompassed by the responsibilities delineated in the TO&E. For each of these functions a mission statement is developed from information provided in the paragraph. Continuing the example of the HAWK FDC, the functions of coordinate, control/direct, acquire, communicate, service and repair were judged to be encompassed by the TO&E paragraph on FDC responsibilities. Mission statements were developed for each of these functions. Examples of these mission statements are presented below:

   - Provide command, control and coordination for ADA Battalion.
   - Provide on-site maintenance for the TSQ-73.
   - Operate manual BOC.
   - Review, evaluate and disseminate Air Defense Command and Control information and conduct Air Battle as a crew.
   - Provide MANPADS Teams and provide early warning to MANPADS Team.
   - Assist in Air Space management.
   - Operate ADV Net Control Station.
   - Emplace and prepare TSQ-73 System for operation.

3. If there are functions remaining after step 2, this indicates that there are implied missions to be developed. Using their experience in the unit element under study, SMEs in the group develop an implied missions statement for each of the remaining

II-32

functions. In our example of the HAWK FDC three functions
remain: train, denial, and RSOP. The implied missions
developed for these functions were:

- Conduct training/evaluations.
- Implement denial plan.
- Participate in RSOP.

A4. Select Mission Criticality Assessment Board. Once unit and unit
element missions have been developed, a mission criticality assessment is
conducted. As described earlier the purpose of the criticality assessment
is to determine which missions merit expenditure of training resources.
The criticality assessment involves soliciting ratings of criticality from
a board of SMEs. Selection of the mission criticality assessment is the
first step in performing the assessment. The quality of the data provided
in the assessment will depend to a great extent upon the quality of the SMEs
that reside on the board. Thus, some care must be taken in choosing board
members.

Generally, evaluation of a mission's criticality is based on considera-
tion of the mission's importance to unit success on the battlefield. In
order to make such a determination, SMEs must have a good understanding of
a unit's combat capability and the manner in which each unit element con-
tributes to accomplishment of the unit mission. Indepth knowledge of the
operation of any one element is not required. Rather, a good overall under-
standing of unit functioning and the dependencies between elements is needed.
Ex-unit commanders and operations officers usually possess such knowledge.
They are ideal candidates for the mission criticality assessment board. A
good size for the board is five to nine members.

The exact manner in which the criticality board is acquired depends on
the procedures required at the post where the CFEA is being conducted. Often
a central tasking agency must be used. If at all possible the board should
be assembled informally. This takes less time and it also provides the team
with more control over the SMEs obtained.

T6. Develop Mission Criticality Assessments. In this step the pro-
cedures used to assess mission criticality are developed. As described above

II-33

the criticality assessment is performed by soliciting ratings of criticality from SMEs. Ratings provide an ideal vehicle for conducting the assessment because they provide some control and standardization of the factors SMEs consider when evaluating missions and because they can be performed quickly and easily.

Essentially, development of the criticality assessment involves specifying the dimensions or factors on which criticality ratings will be obtained and developing a rating scale for each factor. The criticality factors represent the features that differentiate critical and non-critical missions. Different factors are considered in evaluating unit missions and unit element missions. The scale defines the range of rating response options for a factor. A scale can be numerical (e.g., members from 1 to 3, 1 to 5, etc.) or it can use rating categories such as 'low', 'medium', and 'high'. Regardless of the type of scale selected, points on the scale are defined so that the rater has points of reference for making ratings. Generally, the extreme points of the scale are defined. Often, intermediate points are defined as well. The factors considered in evaluating criticality of unit and unit element missions are described below. Also, some rating procedures are provided for assessing the two types of missions.

Assessment of Unit Missions

As described earlier there are two types of unit missions: primary and secondary. Primary missions reflect the essence of the unit. They are always considered to be critical. Criticality of secondary missions is not as apparent. The key factor to be considered in assessing criticality of a secondary mission is the extent to which it enables or facilitates accomplishment of a primary mission. Strategic deployment, for example, is a secondary mission that enables a unit to move to the location where it is to perform a primary mission. Thus, strategic deployment would be a critical secondary mission for units in the Continental United States (CONUS) that are expected to participate in the defense of Europe.

A sample set of instructions and rating forms for assessment of unit mission criticality is presented in Figure II-8.

II-34

Instructions for Rating Criticality of Hawk Battalion Mission Statements

On the page that follows is a list of missions for a Hawk battalion. Read each statement carefully, then:

1. Identify each mission as primary or secondary. If you identify the mission statement as a primary mission, record a "P" in the column to the right of the mission statement that is labeled "P or S."

If you identify the mission statement as a secondary mission, record an "S" in the column to the right of the mission statement that is labeled "P or S."

2. If you identify a mission as secondary (S) rate the criticality of the secondary mission. Record your response in the column labeled "Rating." Rate the criticality of the secondary mission using one of the following three rating factors:

H – High criticality. The secondary mission must be performed successfully if the battalion is to accomplish its primary mission.

M – Moderate criticality. Successful performance of the secondary mission will facilitate or aid accomplishment of the battalion's primary mission.

L – Low criticality. Performance of the secondary mission has little or no effect on accomplishment of the battalion mission or there is a very low likelihood that performance of the mission would ever be required.

Figure II-8. Sample of Instructions and
Form for Rating Unit Missions

II-35

Rating Form for Hawk Battalion Mission Statements

MISSION NUMBER	MISSION STATEMENT	P or S	Rating
BN00A00	Provide low altitude air defense against hostile targets	P	
BN00B00	Provide disaster relief	S	L
BN00C00	Control civil disturbances	S	L
BN00D00	Participate in rear area protection plan (RAPP)	S	m
BN00E00	Engage in tactical deception	S	m
BN00F00	Conduct rapid deployment (RD)	S	H
BN00G00	Deploy as part of Reforger	S	L

Figure II-8 (Cont'd)

In assessing criticality of unit missions a two step approach is suggested. In this approach board members are first presented with all of the unit missions derived in the study and are asked to indicate which are primary missions and which are secondary missions. This step permits identification of secondary missions so they can be evaluated further to determine their criticality. While the CFEA team will usually know which missions are primary and which are secondary before performing this step, it is a good idea to perform it anyway because it provides some validity for the classification of missions imposed by the CFEA team.

In the second step the criticality of those missions identified as secondary is assessed. Of course, the primary consideration here is the extent to which the secondary mission enables or facilitates accomplishment of the primary mission(s). A three level rating scheme is used. The response options are:

1. High criticality. The secondary mission must be performed successfully if the battalion is to accomplish its primary mission.

2. Moderate criticality. Successful performance of the secondary mission will facilitate or aid accomplishment of the battalion's primary mission.

3. Low criticality. Performance of the secondary mission has little or no effect upon accomplishment of the battalion mission or there is a very low likelihood that performance of the mission would ever be required.

Assessment of Unit Element Missions

In assessing criticality of unit element missions two factors are given primary consideration. These are effect of failure of a unit element mission on accomplishment of the unit mission and effect of failure of a unit element mission on survival of personnel and equipment. A unit element mission that has an important influence on the outcome of a unit mission is deemed critical. Many element missions performed in support of the combat operations of a unit (e.g., provide refueling) would be considered to

II-37

be critical because they affect the ability of a unit to continue to perform its missions. Element missions that affect survival of personnel and equipment are important because they have an indirect influence on accomplishment of the unit mission. When these missions fail, valuable personnel and equipment are lost, and resources available for performing the unit mission are reduced. Missions involved in NBC operations are a good example of element missions critical to survival of personnel and equipment.

Thus, a two factor approach is suggested for assessing criticality of unit element missions. The two factors with some suggested response options are presented below.

1. Is this mission critical to accomplishment of the overall (primary) unit mission (mission importance)?

   a. Low criticality. Success or failure will not measurably affect accomplishment of the overall mission.

   b. Moderate criticality. Failure of the mission could hinder or reduce accomplishment of the overall unit mission.

   c. High criticality. Failure of the mission will seriously degrade or prevent accomplishment of the overall unit mission.

2. What is the immediate/direct result of mission failure on survival of the unit in combat (survival).

   a. Low criticality. Failure of the battalion element mission has little or no effect on survival of unit personnel and equipment.

   b. Moderate criticality. Failure of the battalion element mission could affect survival of unit personnel and equipment.

   c. High criticality. Failure of the battalion element mission will result in unacceptable loss of unit personnel and equipment.

An example of instructions and a rating form used for collecting unit element criticality data is presented in Figure II-9.

II-38

Instructions for Rating HAWK Battalion Element Missions

Rating the mission statements:

   a. Before beginning the rating process read each mission statement
       carefully.

   b. If you think a mission statement is really a collective task,
       make a note of this on the data sheet by the mission statement.

   c. Rate the missions on each of the two factors described below
       using the rating responses defined for each factor.

FACTOR

   1. Is this mission critical to the accomplishment of the overall
       unit mission?

       L. Success or failure will not measurably affect overall mission.

       M. Failure could hinder or reduce unit mission accomplishment.

       H. Failure will seriously degrade or prevent overall unit mission
           accomplishment.

   Think about the primary mission(s) you identified earlier and ask
yourself this question, "how much will success of failure of the mission
under consideration affect accomplishment of that/those primary mission(s)?"

FACTOR

   2. What is the immediate/direct result of mission failure on survival
       of the unit in combat?

       L. Has little or no effect on survival of personnel or equipment.

       M. Mission failure could endanger personnel or equipment.

       H. Mission failure will result in unacceptable loss of personnel
           or equipment.

   By survival we mean the ability of the unit to react to and protect
itself from enemy activities that would result in a loss of personnel and
equipment that would impair the units' ability to accomplish its primary
mission. We view survival as separate from support related functions
(e.g., resupply of personnel and equipment) which help the unit sustain
operations. There is another rating factor that deals with sustained
operations. Example of missions that impact a unit's ability to survive
are provision for ground defense, provision of SHORAD, and conduct of NBC
operations.

                    Figure II-9. Sample of Instructions and
                                  Form for Rating Unit missions

                                  II-39

Organization **HEADQUARTERS HEADQUARTERS BATTERY**   MISSION CRITICALITY ASSESSMENT WORKSHEET

Section **ADMINISTRATION, CHAPLIN AND S-1**

Section # **03**

Mission Number	Mission Statement	Critical to Overall Mission 1	Results of Failure on Survival 2
B03A00	Provide personnel administration for battalion	L	L
B03A01	Process personnel actions, including legal actions, promotions, units strengths, discharges, reenlistments, commissions, reduction, military justice and DACs. Provide replacements, correspondence, reports, report losses, SIDPERS, filing system and distribution	L	L
B03A02	Perform morale enhancing services – chaplains, parties, awards, mail, sports, personnel/professional development, billetings unit fund	L	L
B03A03	Process POW's	L	M
B03A04	Oversee Battalion safety program	L	L
B03A05	Oversee comptroller functions	L	L
B03A06	Serve as Public Information Officer	L	L
B03A07	Maintain unit historical file w/S-3	L	L

II-40

Figure II-9 (Cont'd)

When the rating factors and scales have been developed, rating materials are prepared that provide instructions for making ratings and forms for recording the ratings on each mission to be evaluated. Rating forms and instructions should be similar to those presented in Figures II-8 and II-9. Instructions need not be too detailed. They should define the rating factors and describe the rating process. Instructions for rating primary and secondary missions should define the two types of missions and discuss their differences. In addition, some information on the CFEA process and the role of the criticality assessment in that process might be of interest to the board members. It will provide a context for their rating activities and, hopefully, give more importance to those activities.

T7. Convene Board and Assess Mission Criticality. In this step the mission criticality assessment board is assembled and provided with instruction in the rating process. Then ratings of unit and unit element mission criticality are elicited from the board. Finally, the CFEA team analyzes the rating data to determine which missions are critical and which are non-critical.

Obtaining Ratings from the Board

Basically ratings can be obtained from the board in one of two ways. The ideal way is to have them make the ratings as a group. That is, have them review the missions together and agree on a single rating for each mission on each factor. This approach is advantageous for several reasons. First, it permits the CFEA team to monitor the rating process and make sure that the board members pay close attention to the rating factors used and do not involve other extraneous considerations. Also, this approach reduces the amount of work to be done in analyzing the data because it is not necessary to pool the ratings of each board member to obtain a rating consensus.

Unfortunately, obtaining ratings from the board as a group can be a very time consuming process. Many board members just won't have the time to devote to a group meeting. Instead, they will want to make their ratings individually, as their time permits. In this situation simply give the board members the rating materials and set a date for their return.

II-41

Analyzing Criticality Data

As indicated above the amount of work involved in the analysis of criticality data is dependent upon the manner in which the data are collected. The principal component of the data analysis involves comparison of ratings of a task against a set of criticality criteria. The criticality criteria specify the ratings a mission of a given type must have in order to be deemed critical Before missions can be compared against the criteria, however, a single rating must be obtained for each mission on each factor used to evaluate it. If ratings were obtained from the board as a group, then a single rating exists for each rating. The data can be compared against the criticality criteria immediately. If, however, each board member provided his own set of ratings, then, a consensus must be obtained among the ratings. Basically, the rating consensus is the rating the board tended to give a mission on a factor. In on a given factor, for example, six board members rated a mission as having high criticality and one rated it as having low criticality the consensus of the board would be a rating of high criticality.

A set of resolution tables has been developed which allows for quick determination of rating consensus. Essentially, the tables define situations in which a clear consensus exists among ratings. The tables were developed for ratings in which three possible responses of 'high', moderate', and 'low' are offered and are based on the number of raters responding to a factor. They can develop a consensus rating from ratings provided by five to nine raters. The complete set of tables is presented in Appendix A. An example of a resolution table is presented as Figure II-10.

To use the resolution tables to develop consensus ratings for a mission on a factor:

1. Select the table that corresponds to the total number of ratings made on the factor.

2. Note the number of 'high', 'moderate' and 'low' rating on the factor.

3. Compare the observed number of 'highs', 'moderates' and 'lows' with the different rating combinations listed in the table until a match is found.

Resolution Table for N=6 Raters

IF Highs = 4 then consensus rating = High

IF Moderates = 4 then consensus rating = Moderate

IF Lows = 4 then consensus rating = Low

IF Highs = 3 and Moderates = 3 or 2 then consensus rating = High

IF Highs = 3 and Moderates = 1 or 0 then consensus rating must be resolved

IF Highs = 2 and Moderates = 3 or 2 then consensus rating = Moderate

IF Highs = 2 and Moderates = 1 then consensus rating must be resolved

IF Highs = 1 and Moderates = 2 or 3 then consensus rating = Moderate

IF Highs = 0 and Moderates = 3 then consensus rating = Moderate

Figure II-10. Sample Resolution Table

4. Note the consensus rating of the table combination that matches the numbers of 'highs', 'moderates' and 'lows' obtained.

As an example of the resolution process, suppose that six ratings are obtained for a factor. Out of these six ratings there are three highs, two moderates and one low. Referring to Figure II-10 we compare this combination of ratings with the combinations listed in the table and observe that the consensus rating is 'high' (If Highs = 3 and Moderates = 3 or 2 then consensus rating = High).

Referring again to Figure II-10, note that there are combinations of ratings for which no clear consensus exists (e.g., If Highs = 3 and Moderates = 1 or 0 then consensus rating must be resolved). When a consensus rating cannot be obtained for a factor the factor is flagged for resolution by the board pending the outcome of the second step in the analysis of mission criticality data. If these unresolved rating factors prevent a mission from being determined as critical or non-critical then the mission is returned to the board.

The last step in the analysis of criticality data involves comparing consensus ratings of a mission against criticality criteria. Different criteria are used to determine criticality of unit and unit element missions because different factors are used to evaluate the two types of missions.

In rating unit missions board members were asked to indicate which were primary missions and which were secondary missions. Given a mission was identified as a secondary mission, its criticality was rated as high, moderate, or low depending on the extent to which the mission facilitated accomplishment of the primary mission. The criticality criterion for unit missions is:

1. If a mission is identified as primary it is critical.
2. If a mission is identified as secondary and is rated as high or moderate in criticality it is critical.
3. If a mission is identified as secondary and rated as low in criticality it is non-critical.

II-44

Thus, criticality of a unit mission is based on whether the mission was identified as a primary mission or a secondary mission that influences performance of the primary mission.

In rating unit element missions board members were asked to rate each mission in terms of its importance to accomplishment of the unit mission and to survival of unit personnel and equipment. Response options of 'low', 'moderate', and 'high' criticality were provided for each factor. Each of these two factors is important in and of itself as a determiner of mission criticality. The criterion for criticality of unit element missions is:

If a mission is rated as Moderate or High on either mission importance or survival it is critical.

After comparing missions against the criteria a list of critical and non-critical missions is prepared. If criticality of some missions cannot be determined because of a lack of consensus among ratings these missions must be placed before the board for resolution. Remember, however, if the problem is in obtaining a rating of high or moderate on a factor, there is no need to put the mission before the board for resolution. The mission is critical. Really, the only missions that have to be put before the board for resolution are those for which the choice of the consensus is between a rating of moderate or low on both factors.

The Task Analysis Phase

Once the critical missions have been determined the task analysis phase begins. There are three major sets of activities in the task analysis phase. They are:

1. Delineation of collective tasks.

2. Assessment of task criticality.

3. Analysis of tasks.

Delineation of collective tasks involves specifying the collective tasks that support each of the unit element missions deemed critical in the mission analysis phase. Specification of collective tasks has been broken down into

II-45

several well defined steps (T8 through T11 in the model). In developing
the process for specifying tasks the objective was to minimize the number
of different things the analyst has to do at any one point in the process.
This permits full concentration on the activity at hand. The result should
be a more thorough list of activities that conform to the definition of a
collective task.

After tasks have been delineated a criticality assessment is performed.
As with the assessment of mission criticality, the objective of the task
criticality assessment is to determine which tasks merit training. Again,
the approach to the criticality assessment involves soliciting ratings from
SMEs. Factors considered in assessing task criticality are similar to those
used in the mission criticality assessment. Importance of a task to the mis-
sion it supports and to survival of personnel and equipment are primary factors
along which collective task criticality is evaluated. Of course, other factors
can be used also, depending upon the specific questions of interest in the
assessment.

In the last set of activities in the task analysis phase, tasks deemed
critical are analyzed to determine the elements of performance, responsi-
bilities of personnel performing the task, and conditions and standards for
task performance. These information items are critical for developing train-
ing for collective tasks. The level of detail to which tasks are described
depends on the types of training products that will be developed from the
CFEA. If the objective is only to develop an ARTEP the major elements of
task performance are described along with a general discussion of personnel
responsibilities in task performance. If drills are to be developed, a
detailed description of task performance will be provided that specifies
exactly the actions taken by each member of the task performance team. Once
the task analysis is complete the results of the analysis are submitted to
a verification and validation process. In the verification/validation
process the accuracy and completeness of the task analysis is assessed.

Each of the steps in the task analysis phase is described below.

T8. Allocate Personnel to Missions. In this step the unit's table of organization and equipment (TO&E) is reviewed and the personnel and equipment involved in each unit element mission are determined. This is the first step to determining the collectives of personnel that perform the collective tasks. Under each unit element mission collective tasks are specified along with the personnel performing those tasks. In specifying the personnel that perform a given unit element mission the objective is to indicate the Military Occupational Specialties (MOSs) involved and determine the numbers of personnel drawn from each MOS and their respective skill levels.

Specifying the personnel involved in each mission aids specification of both the tasks performed under a mission and the personnel that perform these tasks. Often personnel involved in a mission are a subset of the personnel in a section. Thus, specifying the personnel that participate in a mission can reduce the number of personnel that must be considered when determining the personnel who perform the tasks that support the mission. As an aid to specifying the tasks that support a mission, knowledge of the personnel that participate in a mission gives a good indication of the types of tasks performed in support of the mission. Insight to the types of tasks performed in a mission can be obtained by studying job related documentation of the personnel that participate in the mission. Delineation of personnel involved in a mission is accomplished by considering the types of activities performed in the mission, identifying the skills needed to perform those activities, and specifying the personnel in the TO&E that have those skills. Soldier's Manuals for an element's personnel provided a good source of information on the skills possessed by its personnel.

As an example of the process of allocating personnel to missions consider the Commo platoon of a HAWK battalion. The Commo platoon performs a variety of missions in order to provide the battalion with communications. Some of these missions are to set up AM and FM radio nets, provide wire communications, and provide automatic tactical data link (ATDL) between the command and control system and the fire units. Each of these missions involves

II-47

different activities and, hence, different skills. The mission of providing wire communications involves activities such as drawing net diagrams, laying wire, typing in field phones, setting up a switchboard, and repairing malfunctions in the network. Within the Commo platoon there are personnel such as 36Cs (Wire Systems Installer/Repairer) who are specially trained in the set-up, operation, and maintenance of wire networks. These personnel would be listed among those performing the mission of providing wire communications.

T9. Describe Mission Activities. The purpose of this step is to develop a general description of all of the activities that are performed in support of a unit element mission. The results of this step provide a basis for specifying collective tasks and helps to insure a thorough list of tasks.

First, SMEs on the team map out the sequence of activities performed in the mission. In generating the sequence, do not be concerned with whether the activities constitute tasks. The intent is to provide a description of the flow of events in time during the mission. The sequence is helpful because it gives an indication of the dependency between events. This information will be important when activities are organized into tasks later. Once the sequence of activities has been described so called "conditional" activities are specified. Conditional activities are not inherent in the mission but are performed in response to special conditions that might arise during the mission. Maintenance related activities are often conditional activities. An example of an activity description for a Commo Section's mission of "establish and maintain wire communications" is provided below:

     a. Sequence of activities

        lay wire $\longrightarrow$ tie in phones and switchboard $\longrightarrow$ check out system $\longrightarrow$ relay message traffic

     b. conditional activities

        isolate and repair a fault in the commo system

T10. Allocate Personnel to Activities. In this step the personnel in a section who were identified in step T8 as performing a mission are allocated to the activities specified for that mission in step T9. Thus, for the Commo

Section mission described in step T9, the personnel indicated in step T8 as participating in establishing and maintaining wire communications are allocated to the different activities (e.g., lay wire, tie in phones and switchboard, etc.) performed in that mission. Allocation of personnel to activities involves consideration of the kinds of skills required to perform an activity and identification of the personnel that possess those skills. Also, the number of personnel of a given type that are required to perform an activity should be specified.

If desired a matrix can be used in the allocation process. An example of a matrix used to allocate personnel to activities is provided in Figure II-11. The matrix illustrates allocation of personnel involved in the mission 'provide wire communications' to activities performed in that mission.

T11. Develop Task Statements. The objective of this step is to develop collective task statements and specify the personnel that perform each collective task. Each activity listed in T9 is reviewed to determine which activity represents a unit of work in and of itself that can be called a task. Next, the activity statements are reviewed again to determine which combinations of activities reflect a unit of work that could be called a task. Based on this review, proper task statements are developed which describe the work performed in an activity or group of activities considered to constitute a task. Remember, collective tasks are those tasks developed from activities that are performed by more than one person. The collective performing a task is the personnel listed as performing the activity or activities that constitute the task.

As an example of the process of developing task statements, consider the data presented in Figure II-11. The activities 'lay wire', 'tie in phones and switchboard', and 'check out system' can be combined to form a single task called set-up wire communications. The activity 'relay message traffic' constitutes a task in and of itself. The activities involved in set-up of wire communications are performed by a number of Wire Communications Installers/Repairers (5), a Switchboard Operator and a Wire Communications Supervisor, so 'set-up wire communications' is a collective task. The task relay message traffic is performed by one Switchboard Operator so it is an individual task.

II-49

Activities	Wire Systems Installer/ Repairer (Skill Level 1)	Wire Systems Installer/ Repairer (Skill Level 2)	Switchboard Operator	Wire Communications Supervisor
lay wire	3	2		1
tie in phones and switchboard	3	2	1	1
check out system		1	1	1
relay traffic			1	
isolate and repair a fault	1	1		1

Figure II-11.   Sample Matrix for Allocating
Personnel to Mission Activities

A5. Select SMEs for Task Criticality Assessment. As with the unit and unit element missions, the collective tasks must be assessed to determine which tasks are sufficiently important to warrant training. As described earlier, assessment of collective task criticality is performed by SMEs who provide ratings of task criticality. Thus, an important aspect of the task criticality assessment is the selection of SMEs. Because of the specific nature of the knowledge required to evaluate task criticality the type of SMEs required is somewhat different than that required to evaluate mission criticality. The task criticality assessment requires SMEs who have an indepth knowledge of the operation of the different sections of the unit under analysis. Ideally, criticality of tasks performed in a section is evaluated by SMEs drawn from that section. Once again five to seven SMEs is a good number for rating criticality of a task.

T12. Develop Task Criticality Assessment. In this step, procedures for assessing task criticality are developed. Once again ratings are used. The first step to developing rating procedures involves specifying the factors or dimensions along which task criticality would be assessed. Specification of rating factors is based on consideration of the kinds of information that should be provided by the criticality assessment.

Given that the primary purpose of most CFEAs is to develop a new ARTEP, an important output of the criticality assessment process is a list of the tasks that should go into the ARTEP. In addition, it is recognized that there is other information that would be useful to trainers and training developers. This information has little to do with ARTEP development but can help develop more effective training in general and expend training resources more wisely. A list of questions was developed that reflects the kinds of information training developers might find helpful from the criticality assessment. These questions provide a basis from which to specify the rating factors used in the criticality assessment. The questions are listed below and discussed in terms of the factors to be considered in answering them:

II-51

1. Which tasks should be included in the ARTEP? This as the question
    of primary concern in the task criticality assessment. It
    had to be considered in light of the fact that the main purpose
    of the ARTEP is to support training of the critical missions
    identified earlier. The tasks that should go in the ARTEP,
    therefore, are ones that have a major impact on those missions.
    Thus, the principal factor to be considered in assessing task
    criticality is the importance of the task to the element mission
    it supports and to the unit mission. A second factor should be
    considered also. This factor addressed the hazards associated
    with performance of a task. It was judged that the tasks which
    are hazardous to perform should be included in the ARTEP even
    if they do not have an important direct effect on a mission.
    Unsuccessful performance of such tasks could result in injury
    or loss of personnel and equipment which in turn could affect
    performance of missions.

2. Where should tasks be trained initially (resident school or on
    the job [OJT])? Whenever possible, tasks are trained on the
    job. OJT is less expensive than resident training and can be
    conducted while the trainee is engaged in other, productive
    job activities. However, some tasks are difficult to learn
    and perform. Such tasks are learned better in a structured
    environment totally devoted to training such as a resident
    school. Other tasks might not be particularly difficult, but
    a soldier is expected to be able to perform them when he
    reaches his unit. There is not enough time available to train
    these tasks OJT, so they must be trained in a resident school.
    Thus, the major factors affecting whether a task is trained
    OJT or in a resident school are the difficulty of learning or
    performing the task and how soon after arriving at a unit a
    soldier is expected to perform the task.

3. Which tasks should be considered for periodic refresher training? Sometimes there exist tasks that are important to accomplishment of an element or unit mission but the tasks are performed infrequently on the job and performance proficiency decays rapidly in the absence of practice. If proficiency on these tasks is to be maintained, periodic retraining must be arranged so performance can be practiced. In order to identify these tasks information must be obtained on the frequency with which tasks are performed and the rate at which performance decays in the absence of practice.

4. For which tasks should performance be certified? Certification means that a student's performance of a task is observed to insure that the student is capable of performing the task to field standards. Only certain tasks should be certified because the process can be time consuming. Generally, end of course testing involves observing performance of a selected sample of the tasks taught in the course. However, certification should always be required for tasks which must be performed immediately upon onset of the cue for task performance and that are critical to mission accomplishment or survival of personnel and equipment. There is no margin for error in these tasks and there is not sufficient time to seek assistance to perform the task. It must be assured that personnel can perform these tasks and certification provides this assurance.

5. Which tasks should receive refresher training prior to the unit going to war? Many of the tasks performed in a unit are critical to accomplishment of an element mission and the unit mission but are performed only in time of war. The only time unit personnel get to practice these tasks in peacetime is during specially arranged training situations which may occur infrequently. Thus, it is difficult to maintain proficiency on these tasks. In the event of war it would be a good idea to provide some special training on these tasks prior to deploying so that unit performance will be enhanced. In order to identify these tasks information must be provided on which tasks are performed in wartime only.

6. Which tasks should be considered for reduced training in time of war? In time of war it is important to minimize the amount of time spent in training soldiers so they can be sent to combat as soon as possible. One way to reduce training time is to reduce the time spent training certain tasks. Tasks that are moderately difficult to learn and perform are ideal candidates for reduced training time. Often personnel can be given some introductory training on these tasks in school and that training is sufficient to support proficiency development on the job.

7. Which tasks should be considered for elimination from training altogether? As indicated under question one above the only tasks that should be considered for training are those that have an impact on accomplishment of an element or unit mission or on the survival of personnel and equipment. Thus, tasks that have no influence on element or unit missions or on survival of personnel and equipment should be considered for elimination from training. In addition, tasks that have been deemed moderately important to an element or unit mission but are very easy to learn and perform should be considered for elimination from training, especially proficiency maintenance training, because training time and re-sources would be wasted training tasks personnel can already perform well.

Based on the above questions a nine factor rating scheme has been devised for assessing criticality of HAWK collective tasks. The rating factors and the response options for each are presented in Table II-2. You can develop your own criticality assessment by selecting the questions you want answered and then selecting the rating factors you will use to answer them. Once you have selected the factors to be used develop rating forms and instructions. A sample form for collecting task criticality ratings is provided in Figure II-12. Once again, instructions need not be detailed. They should define the rating factors and describe the rating process.

Table II-2

Task Criticality Dimensions

A. Learning Difficulty - Is the task hard to learn?
   L = Easy to learn - can be self-trained
   M = Some difficulty in learning - requires some assistance to learn
   H = Hard to learn - requires supervision, extensive practice or special
       equipment or environment

B. Performance Difficulty - Is the task hard to perform?
   L = Easy to perform - can perform correctly on initial effort and each
       repetition - includes only simple skills
   M = Some difficulty in performing - requires practice and some supervision
       to perform - moderate level skills
   H = Hard to perform - additional practice and supervision required for
       performance - high probability of some performance failures - includes
       complex skills or skills integration

C. Time Delay Tolerance - What is the time allowed between receiving the task
   cue and starting the performance?
   L = No need to start task at any specific time
   M = Task start can be delayed for several minutes
   H = Must begin immediately or within a few minutes after cue

D. Consequence of Inadequate Performance - How serious is the effect of
   improper performance or non-performance on unit or individual missions?
   L = Has little or no effect on mission of individual or unit
   M = Could degrade or delay mission performance
   H = Could result in mission failure

E. Immediacy of performance - How soon after arrival in field unit could task
   performance be required in wartime?
   L = Not for several months
   M = Within the first several weeks (4-12 weeks)
   H = Within the first one to four weeks

F. Task Importance - Is the task important to the survival of personnel and
   equipment?
   L = Failure or non-performance would have little or no effect on survival
       of personnel or equipment
   M = Failure or non-performance could endanger personnel or equipment
   H = Task must be performed for survival of personnel or equipment

G. Frequency of Performance - How often is the task called for in peacetime
   operations and training?
   L = Infrequently - less than once per month
   M = Occasionally - one or two times per month
   H = Frequently - at least once per week

H. Wartime Task - Is the task oriented towards wartime operations?
   1 = Peacetime only - task is not performed during wartime
   2 = War & Peace - task can be performed both in peace and in war
   3 = Wartime only - task is never performed or practiced until wartime

I. Proficiency Decay Rate - How frequently must the task be performed to
   assure that skills are not reduced below standards?
   L = Task skills require little or no practice to retain proficiency
   M = Task requires infrequent practice - once every one to three months
   H = Frequent practice required - more often than once a month

II-55

CRITICALITY ASSESSMENT OF COLLECTIVE TASKS PERFORMED BY HQ & HQ BTRY FB03A00 - Firing Btry System Maint Sec	Learning Difficulty	Performance Difficulty	Time Delay Tolerance	Consequence of Inadequate Performance	Immediacy of Performance	Task Importance	Frequency of Performance	Wartime Task	Proficiency Delay Rate
Name_____									
Duty Position_____									
Date_____									
MOS_____									
Title_____									
Mission - Tasks									
46. FB03X02 - Assist in operator functions (TCO, TCA, FCO)									
1. Perform O/A as a crewmember 14D, 16D, 16E									
2. Perform ISC's as a crewmember 14D, 16D, 16E									
3. Perform emplacement of equipment as a crewmember 14D, 16D, 16E									
4. Perform preparation for travel as a crewmember 14D, 16D, 16E									
5. Perform alert drills as a crewmember 14D, 16D, 16E									

Figure II-12.   Sample Form for Rating Collective Tasks

T13. Assess Task Criticality. In this step SMEs are provided with rating forms containing the sets of tasks they are to evaluate and are given instruction in the rating process. When the ratings are completed the data are collected and analyzed by the CFEA team to determine which tasks are critical for training and which are not. As in the assessment of mission criticality it is best if ratings can be obtained from SMEs as a group. However, it is recognized that this will not be possible very often. Most of the time the ratings will be made by each SME individually.

The analysis of the task criticality data follows the same basic process used in the assessment of mission criticality. First, consensus ratings were developed for each task on each rating factor. Next, the consensus ratings of each task are compared against a set of criteria which allocate the tasks to the different training categories of interest (e.g., include in ARTEP, train in residence, etc.). Consensus ratings are determined using the resolution tables presented in Appendix A. Based on the questions presented in step T12, eight different training categories have been developed. The categories and the criteria used to sort tasks into these categories are presented below.

1. Include in ARTEP. This category consists of tasks which should be included in the HAWK ARTEP. Because the ARTEP is used to provide training in unit and unit element missions, tasks that are critical to accomplishment of the unit mission and unit element missions must be included in the ARTEP. In addition, tasks which are hazardous to perform should be included because they can have an indirect effect on mission performance through loss of personnel and equipment.

Include in ARTEP if:

a. Consequence of inadequate performance is moderate or high, or task importance is moderate or high.

(D = M or H or F = M or H)

2. Train in Residence. This category consists of tasks that are critical to job performance at initial entry, and must be

trained to field standards in resident training programs.
Train in Residence if: both (A) Learning Difficulty is
moderate and (E) Immediacy of Performance is not low, or
(A) Learning Difficulty is high, and (D) Consequence of
Inadequate Performance or (F) Task Importance is not low.
(A = M and E ≠ L, or A = H, and D ≠ L or F ≠ L)

3. Consider for on the job training (OJT). Tasks in this
category should be trained on the job after initial training
is completed, because they are not difficult to learn or
perform, are not required immediately upon job entry, are
not based on civilian acquired skills, and are not low in
importance to mission success and individual survival.
These tasks do require training, but not necessarily in a
school environment.
Consider for On The Job Training if: (B) Performance
Difficulty is not low, and (A) Learning Difficulty and
(D) Consequence of Inadequate Performance or (F) Task
Importance are not low. (B ≠ L, and A = M, and D ≠ L
or F ≠ L)

4. Consider for Elimination From Training. This category
consists of tasks which do not merit expenditure of training
resources because they are:
a. Not important for mission accomplishment or individual survival.
b. Moderately important, but easy to learn and perform.
Consider for Elimination from Training if:
a. (D) Consequence of Inadequate Performance is low, and
(F) Task Importance is low. (D = L and F = L)
b. (A) Learning Difficulty is low, and (B) Performance
Difficulty is low, and either (D) Consequence of Inadequate
Performance or (F) Task Importance are moderate. (A = L,
and B = L, and D = M or F = M)

II-58

5. Certify Proficiency. Tasks in this category must be per-
formed immediately upon receiving their initiating cues, and
are critical either to mission accomplishment or individual
survival. These tasks require performance testing of pro-
ficiency to field standards for all conditional sets for each
task. The location of certification is determined by the
training location identified in previous sorts. Certify in the
field for tasks identified for OJT. Certify in residence for
tasks identified for resident training. Tasks identified for
maintenance training should be periodically recertified in the
field.
Train to Certification if: (C) Time Delay Tolerance is high,
and either (D) Consequence of Inadequate Performance or (F)
Task Importance is high. (C = H, and D = H or F = H)

6. Provide Maintenance Training. This category consists of tasks
that are not easy to perform, can affect mission performance
or individual survival, and have a skill decay rate that exceeds
the normal performance frequency. These conditions indicate
a need to provide for skill maintenance in the field.
Provide Maintenance Training if: (B) Performance Difficulty is
not low, and (D) Consequences of Inadequate Performance or
(F) Task Importance are not low, or (I) Proficiency Decay
Rate is greater than (G) Frequency of Performance. (B ≠ L,
and D ≠ L or F ≠ L, or G = L and I ≠ L or G = M and I = H)

7. Wartime Refresher Training. This category consists of critical
tasks that cannot receive skill maintenance training under
peacetime training conditions, and must be retrained during
transition to wartime.
Provide Wartime Refresher Training if: (A) Learning Difficulty
and (B) Performance Difficulty are not low, and (H) Wartime Task
is Wartime Only, and either (D) Consequence of Inadequate
Performance or (F) Task Importance are not low.
(A ≠ L, and B ≠ L, and H = 3, and D ≠ L or F ≠ L)

II-59

8. Consider for Reduced Training Time. Tasks in this category should be included in the training program but may merit less training resource expenditure than more critical, or higher risk, tasks. This consideration is required when training requirements exceed the available training resources.
Consider for Reduced Training Time if: (B) Performance Difficulty is not high, and (A) Learning Difficulty is moderate, and (D) Consequence of Inadequate Performance or (F) Task Importance is not low. (B ≠ H, and A = M, and D ≠ L or F ≠ L)

T14. Develop Task Descriptions. Once critical tasks have been specified they are analyzed to determine the elements or steps involved in task performance. The results of the analysis of task steps can be presented at different levels and in different formats. If the task is not well defined the analyst might use a verbal description that discusses generally the activities performed in the task and the responsibilities of the collective members that perform it. If the task is well defined the analyst might choose a more detailed form of presentation such as an operational sequence diagram (θSD).

An example of an OSD is presented as Figure II-13. Essentially, an OSD is a flowchart. Various graphic symbols are used to represent different types of task activities (i.e., transmission of information, decision making, etc.). Activities are linked by lines to show the flow of task performance and to show where task inputs originate and task outputs go. An OSD is divided into panels with each panel corresponding to an individual or piece of equipment. Symbols in a panel show what activities are performed by an individual or piece of equipment and where performance occurs in the sequence. Lines connecting tasks across panels show the interactions between individuals and machines. Brief verbal descriptions are often added to OSDs to provide a more complete description of activities occurring in the sequence.

The format for presenting task descriptions is up to the CFEA team. If you wish to use an OSD format that is fine. On the other hand, you might prefer a crew drill format like that shown in Figure II-14. Either way, the approach to developing task descriptions is the same.

Task: Manually Acquire a Target with the HAWK System

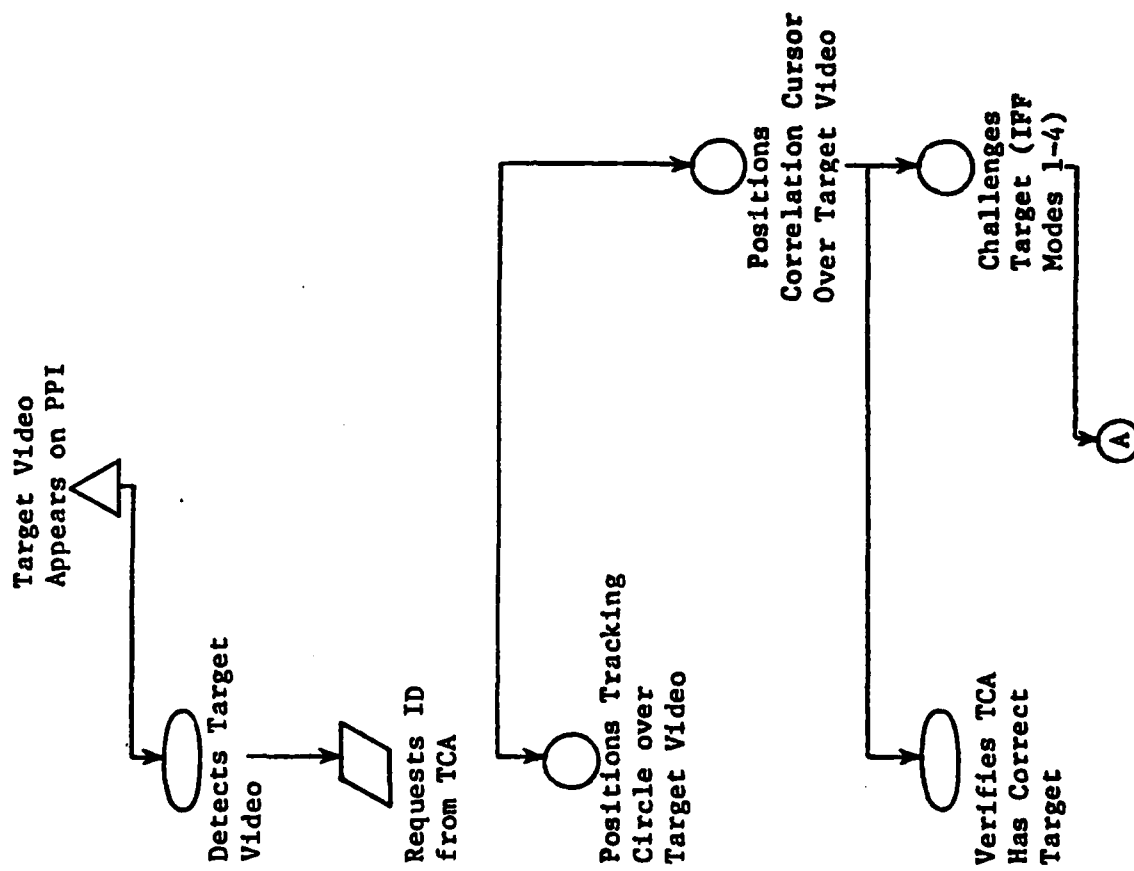FP Status Panel   TCO   TCC   TCA   FC   FCO

Target Video
Appears on PPI

Detects Target
Video

Requests ID
from TCA

Positions Tracking
Circle over
Target Video

Positions
Correlation Cursor
Over Target Video

Verifies TCA
Has Correct
Target

Challenges
Target (IFF
Modes 1-4)

A

Figure II-13. Sample Operational Sequence Diagram
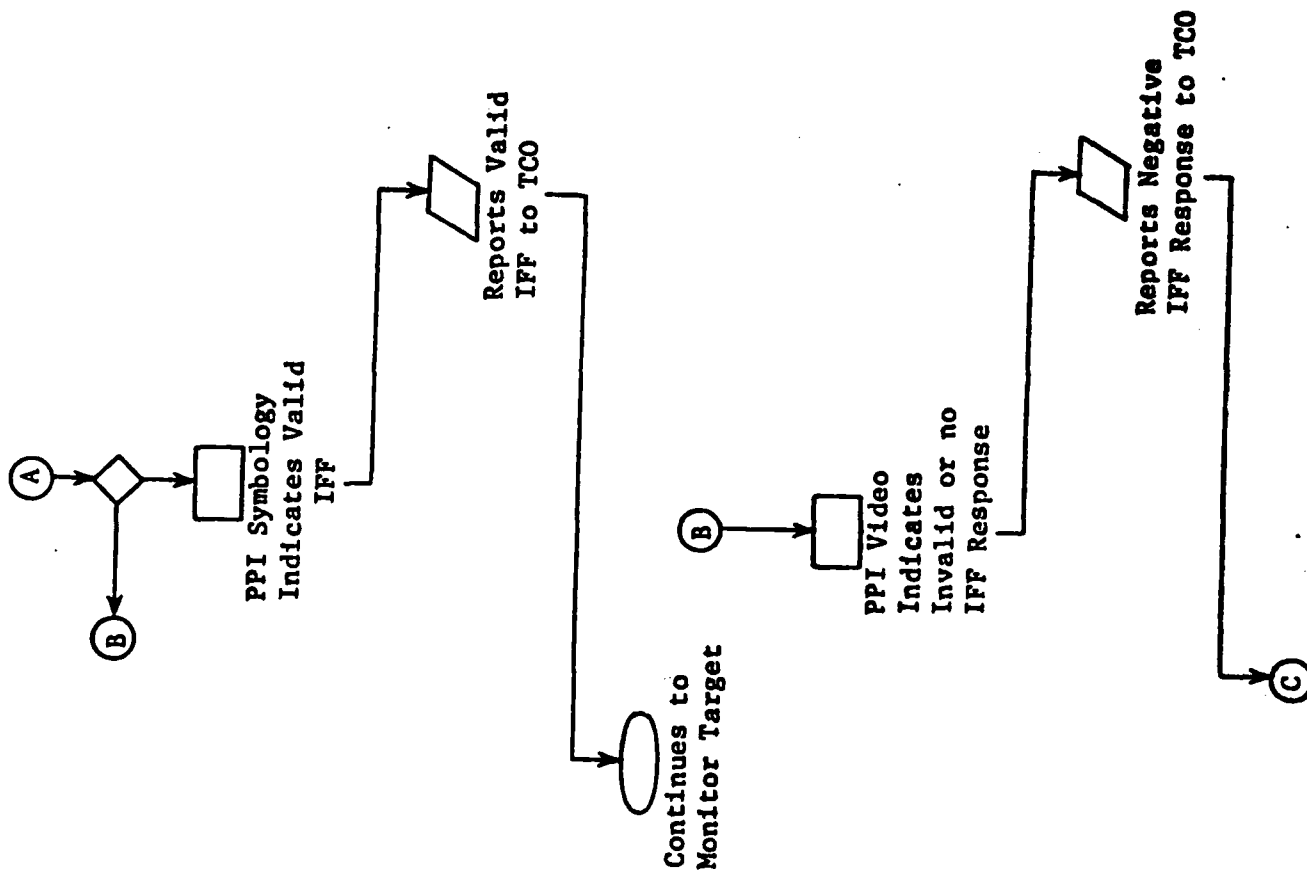
FP Status Panel   TCO   TCC   TCA   FC   FCO

(A)

(B)

PPI Symbology
Indicates Valid
IFF

Reports Valid
IFF to TCO

Continues to
Monitor Target

(B)

PPI Video
Indicates
Invalid or no
IFF Response

Reports Negative
IFF Response to TCO

(C)

Figure II-13 (Cont'd)

II-62

Figure II-13 (Cont'd)

II-63

FP
Status Panel   TCO   TCC   TCA   FC   FCO

(D) → Listens for Doppler; Observes A-scope Video

Doppler Return Captured and Converted to Audio and Video

Observes Doppler Audio or Video

Releases Brake Lock

'Lock' Illuminates on Console

Observes A-scope to Determine Number of Targets

→ (E)

Observes That HIPIR has Locked on Target

'Lock' Illuminates

Figure II-13 (Cont'd)

II-64
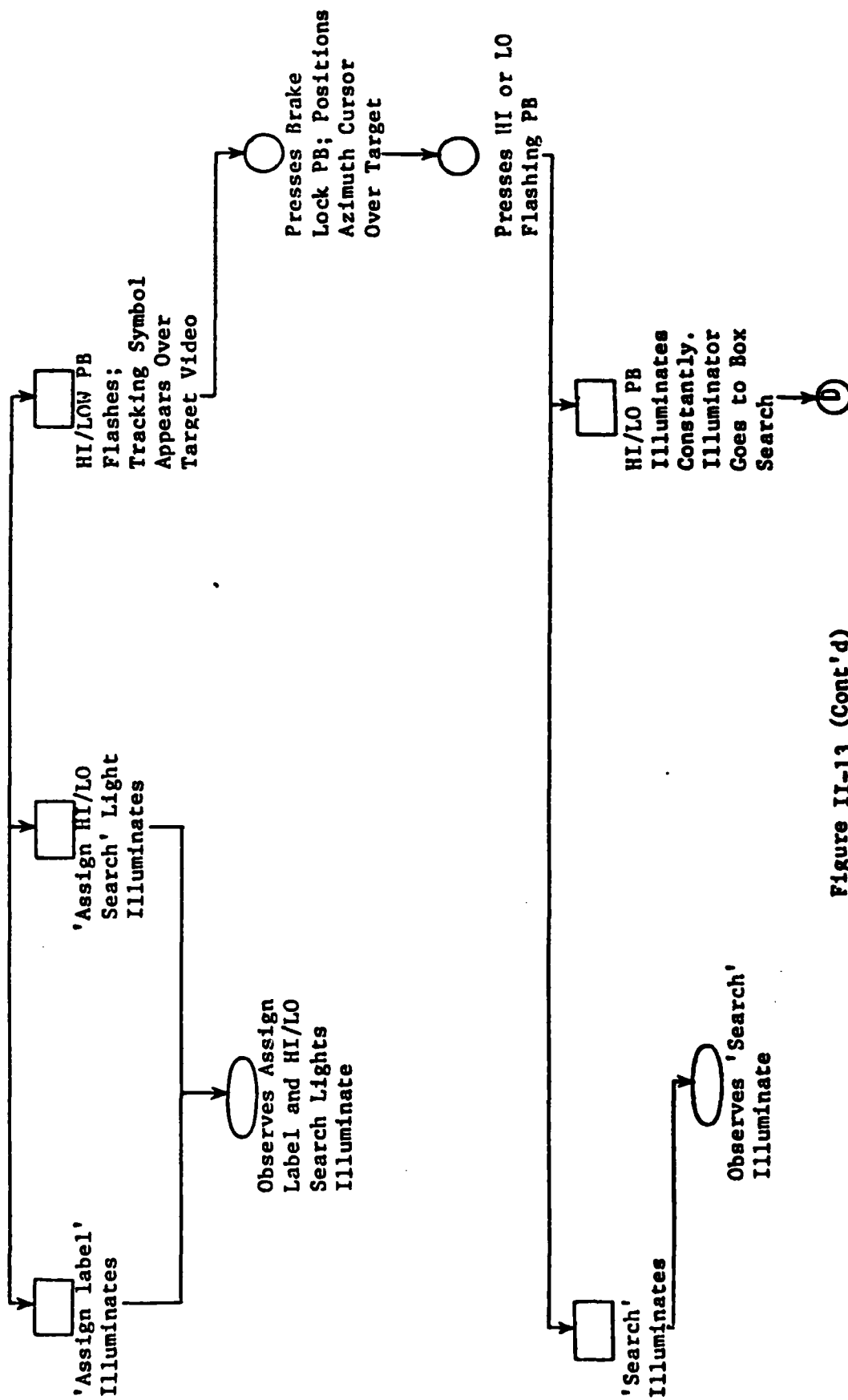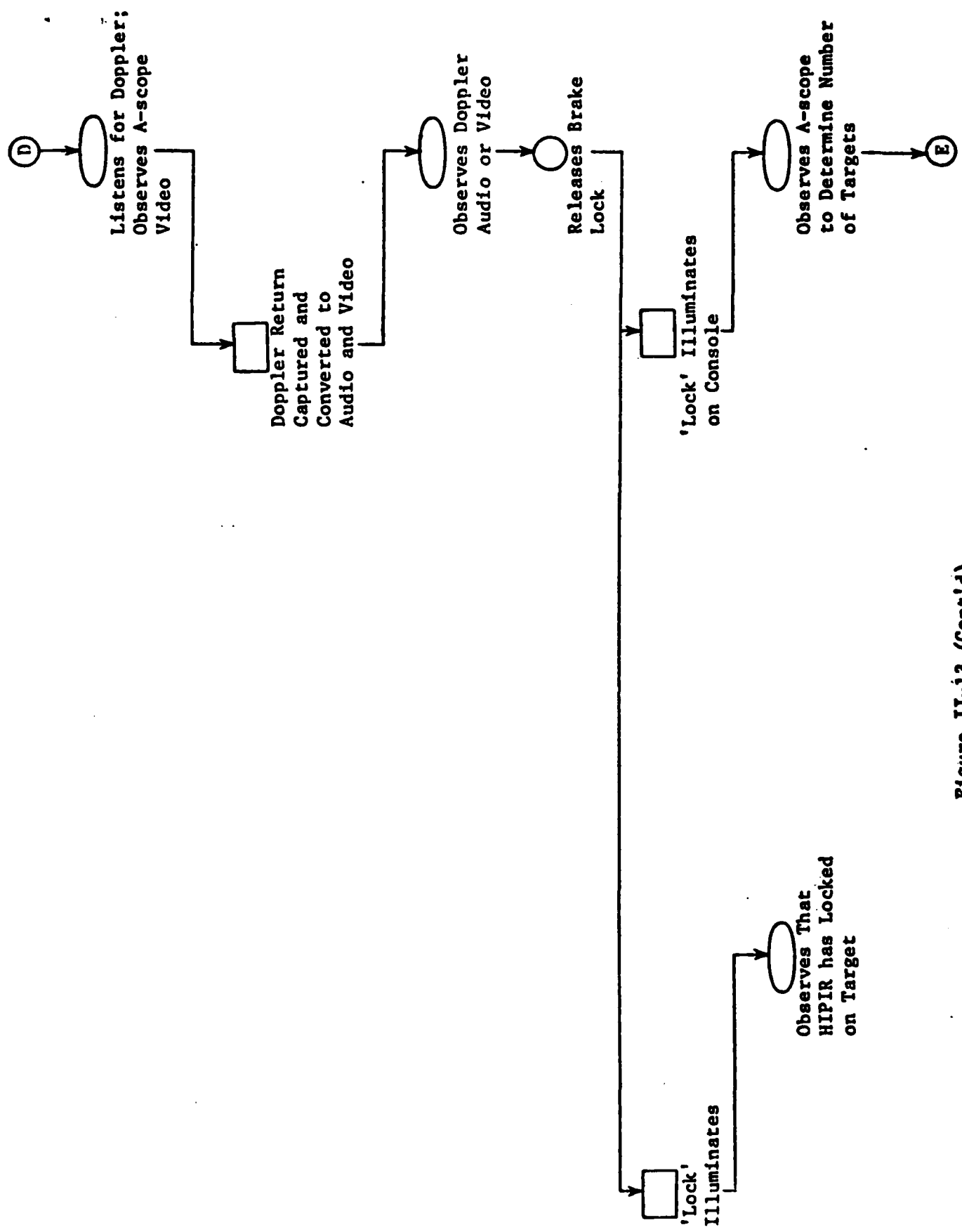
Figure II-13 (Cont'd)

FB04A10.09
Reconstitution

Commander	S1	S2	S3	S4	CE Officer
1. Evaluate Bn assets	1. Evaluate the personnel strength of battalion	1. Intelligence data evaluated: Program expected enemy activity	1. Evaluate Hawk weapon system damage units operational status determined	1. Determine status and availability of pertinent assets	1. Equip status determined
			2. Assemble intelligence data, battle loss of Hawk equip, personnel strength reports, supply status		
			3. Recommends course of action for reconstitution		
4. Evaluates reconstitution plans					
5. Review/ review plan					
6. Implements plan			6. Supervises movement of personnel and/or equip.		

Figure II-14.   Sample Crew Drill Format

Basically, the objective in developing a description of a collective task is to specify what each person involved in task performance does. At this point in the analysis, the personnel who perform a task have been specified. Also, from step T12 we know the activities that are performed in a task. So, developing a task description becomes a matter of specifying what each person involved in a task activity does in performing that activity. If the activities involve individual tasks, then descriptions of those tasks can be obtained from Soldier's Manuals. Another source of information on the actions that occur in an activity are SMEs who perform the task. Often SMEs on the team will have such knowledge. Have them write a verbal description of task performance. Finally, if no source of information is available on the actions that occur in a task, simply observe performance of the task and record what occurs.

Finally, as a task is analyzed, results of the analysis should be recorded on a collective task analysis worksheet. An example collective task analysis worksheet is presented in Figure III-15. The worksheet provides a synopsis of results of the task analysis. For a given task, conditions and standards of performance are specified; personnel who perform the task are delineated; equipment used in task performance is specified; and a description of the task is provided. The description of the task focuses on the major elements of performance and provides a general discussion of the task rather than specifying what each person performing the task does. Finally, individual tasks encompassed in the collective task are specified and references used in analyzing the task are listed.

analyzed a conditions statement is developed which describes the different environments in which the task might be performed (e.g., tropical, desert, NBC, etc.), specifies any preconditions (e.g., checks that must be performed, equipment that must be available, etc.) that enable or preclude task performance, and states the cue that initiates task performance. In addition, standards for task performance are developed that specify how a task is to be performed (process standards) or the characteristics of acceptable task

II-67

BASE PLATOON TASKS

(CORRECTED COPY - 3/25/83)

MISSION: ENGAGE AND DESTROY LOW TO MEDIUM ALTITUDE HOSTILE
          AIRCRAFT AND MISSILES

THE FOLLOWING COLLECTIVE TASKS SUPPORT THIS MISSION:

1. TASK NUMBER: FB04A02.01

2. TASK TITLE: PERFORM BATTLE STATIONS DRILL

3. CONDITIONS:
   Operational Hawk System
   Required communications operational
   All MOPP and weather conditions
   All ECM environments
   Properly Trained Crew
   Unit directed to assume Battle Stations Readiness Posture

4. STANDARDS:
   Hawk Missile System prepared for engagement of hostile aircraft
   within time limit established by current state of alert, with-
   out posing safety hazard to personnel or equipment

5. PERSONNEL PERFORMING TASK:
   TCO   24E
   TCA   24G
   CWTDC (ASIO)   24C
   ICCO
   LCHR CREWMAN 1 and 2
   FCO's
   RCO
   LCHR Crew Chief
   LSCBO

6. EQUIPMENT USED IN TASK PERFORMANCE:
   Hawk Missile System Equipment

7. TASK PROCESS/PRODUCT DESCRIPTION:
   Battery notified to assume BATTLE STATIONS, system communications
   are established, selected local checks and adjustments are perform-

Figure II-15.   Sample Collective Task Analysis Worksheet

ed. selected integrated system checks are performed, launcher sect-
ion checks are performed, umbilicals are connected, all missiles are
armed, and FDC is notified that BATTLE STATIONS have been assumed

8. SUMMARY OF ANALYSIS:

   a. Components of Task:
      Establishment of system communications
      Local system checks (Fire Control)
      Local system checks (LCHR)
      Designated Integrated System Checks
      Report assumption of BATTLE STATIONS

   b. INDIVIDUAL TASKS:
      TCO: Local checks BCC/ Supervise overall operations,
             Monitor Hot Loop
      TCA: Local checks PAR.ROR/ IFF Challenge/Monitor IRR
      ASIO: Local checks CWAR, CWTDC
      FCO A/B: Local checks HIPIR, FC A/B
      ICCO: Local checks ADP, IFF
      RCO: Local checks Commo Net
      LCHR CREW CHIEF: Overall supervision of crew drill
      LSCBO: Monitor's LCHR area safety/ reports status to LCHR crew
      LCHR Crewman 1 & 2: Local Checks Launcher

   c. ANALYSIS TECHNIQUES:
      Standardized Ready for Action Crew Drill
      TC 44-90-1
      FM 44-90-1

Figure II-15 (Cont'd)

outputs (product standards). Standards should be quantitative when possible to allow for more objective evaluation of performance. Examples of conditions and standards statements are provided in the sample task analysis worksheet presented in Figure II-15.

T16. Verify/Validate Task Analysis. In this step results of the task analysis are reviewed to assess the accuracy and completeness of the analysis. In conducting the review the concern is to verify whether:

1. The listing of tasks for the different missions is complete.

2. Performance elements for each task are complete.

3. All personnel performing a task have been listed.

4. All relevant conditions are listed.

The validation portion of the review is concerned with the standards developed for task performance. Standards are evaluated to determine whether they provide a good description of successful task performance or the products of successful task performance and are easy to apply by evaluators.

Basically, there are two approaches to the verification and validation of task analysis results. One approach is to observe the unit at work, note when tasks are performed, and, as they are performed, verify whether the steps are performed as described by the personnel indicated, note the conditions under which performance occurs, and determine whether performance tends to be within the bounds set by standards. Such an approach to verification/ validation is time consuming and labor intensive. For this reason, it is rarely used as the sole means of verifying and validating a task analysis. Instead, so-called "table-top" verification/validation procedures are usually employed. In the table-top approach SMEs are asked to review results of the task analysis to determine their accuracy and completeness. Generally, an interview procedure is developed to guide the review process. A sample of a questionnaire used in verification/validation interviews is presented in Figure II-16. A typical approach to verification/validation combines both observation and table-top procedures. Initially, a table-top review of the task analysis will be conducted. If SMEs cannot agree on the accuracy of completeness of different portions of the analysis performance of the tasks in question might be observed. The particular approach taken to verification/ validation must be decided by the CFEA team.

VERIFICATION/VALIDATION QUESTIONAIRE FOR PANEL LEADERS

The following questions are used to determine wether a task is, or should be performed. As you respond, consider both WARTIME and PEACETIME environments. Circle "Y" for YES. or "N" for NO.

1. Considering this unit and <u>ALL</u> other units with which you have been associated, is this task performed by this section of a HAWK unit? Y / N

2. If this task is not performed in this section, is it performed in any other section of this unit? Y / N

If questions 1 and 2 are both answered "NO", then answer question 3

3. Should this task be performed? Y / N

   a. If "YES", what section should perform it?

   b. If "NO", why not?

If question 1 is answered "YES" or question 3 is answered "YES" and this section is specified, then proceed with questions 4 thru 9. If question 2 is answered "YES" or question 3 is "YES" and another section is specified, complete a data sheet using input from personnel from the section specified. If all 3 (3) questions are answered "NO", the verification is completed and the task will be dropped from the list.

The following questions are used to validate the results of the task analysis. Circle "Y" for YES or "N" for NO. If a question is answered "NO", specify how that item should be changed.

4. Consider item # 7 on the task analysis worksheet. Does the narrative accurately describe the task? Y / N

   If the answer is "NO", what would you add to, delete from, or in any way change in the narrative?

5. Consider item # 3. Are these the conditions under which the task is performed? (A conditions statement should specify: the preconditions for task performance, describe the type of environment in which the task is performed, and specify the cues(s) that initiate(s) task performance.) Y / N

   If the answer is "NO", indicate how the conditions statement should be changed,

6. Consider item # 4. Are these standards reasonable? Do they provide a complete and accurare measure of task performance? Could you apply them if you were an evaluator? Y / N

   If the answer is "NO", how would you change them?

7. Consider item # 5. Do these personnel perform this task? Y / N

   If the answer is "NO", how would you change the personnel list?

8. Consider item # 6. Is this the equipment used in the task? Y / N

   If the answer is "NO", how would you change the equipment list?

9. Finally, consider item # 8c. Are these references correct? Y / N

   If the answer is "NO", how would you change them?

Figure II-16.   Verification/Validation Questionnaire

Appendix A
Rating Resolution Tables

Resolution Table for N = 5 Raters

If Highs = 4 then consensus rating = High
If Moderates = 4 then consensus rating = Moderate
If Lows = 4 then consensus rating = Low
If Highs = 3 and Moderates = 1 or 2 then consensus rating = High
If Highs = 3 and moderates = 0 then consensus rating must be resolved
If Highs = 2 and Moderates = 2 or 3 then consensus rating = Moderate
If Highs = 2 and Moderates = 1 then consensus rating must be resolved
If Highs = 1 and Moderates = 2 or 3 then consensus rating = Moderate
If Highs = 1 and Moderates = 1 then consensus rating = Low
If Highs = 0 and Moderates = 3 then consensus rating = Moderate
If Highs = 0 and Moderates = 2 then consensus rating = Low

Resolution Table for N = 6 Raters

If Highs = 4 then consensus rating = High
If Moderates = 4 then consensus rating = Moderate
If Lows = 4 then consensus rating = Low
If Highs = 3 and Moderates = 2 or 3 then consensus rating = High
If Highs = 3 and moderates = 0 or 1 then consensus rating must be resolved
If Highs = 2 and Moderates = 2 or 3 then consensus rating = Moderate
If Highs = 2 and Moderates = 1 then consensus rating must be resolved
If Highs = 1 and Moderates = 2 or 3 then consensus rating = Moderate
If Highs = 0 and Moderates = 3 then consensus rating = Moderate

Resolution Table for N = 7 Raters

If Highs = 5 then consensus rating = High
If Moderates = 5 then consensus rating = Moderate
If Lows = 5 then consensus rating = Low
If Highs = 4 and Moderates = 1 to 3 then consensus rating = High
If Highs = 4 and moderates = 0 then consensus rating must be resolved
If Highs = 3 and Moderates = 2 to 4 then consensus rating = Moderate
If Highs = 3 and Moderates = 1 then consensus rating must be resolved
If Highs = 2 and Moderates = 2 to 4 then consensus rating = Moderate
If Highs = 2 and Moderates = 1 then consensus rating must be resolved
If Highs = 1 and Moderates = 3 or 4 then consensus rating = Moderate
If Highs = 1 and Moderates = 2 then consensus rating must be resolved
If Highs = 0 and Moderates = 4 then consensus rating = Moderate
If Highs = 0 and Moderates = 3 then consensus rating = Low

Resolution Table for N = 8 Raters

If Highs = 5 then consensus rating = High
If Moderates = 5 then consensus rating = Moderate
If Lows = 5 then consensus rating = Low
If Highs = 4 and Moderates = 2 to 4 then consensus rating = High
If Highs = 4 and moderates = 1 then consensus rating must be resolved
If Highs = 3 and Moderates = 2 to 4 then consensus rating = Moderate
If Highs = 3 and Moderates = 1 then consensus rating must be resolved
If Highs = 2 and Moderates = 2 to 4 then consensus rating = Moderate
If Highs = 2 and Moderates = 1 then consensus rating must be resolved
If Highs = 1 and Moderates = 3 or 4 then consensus rating = Moderate
If Highs = 1 and Moderates = 2 then consensus rating must be resolved
If Highs = 0 and Moderates = 4 then consensus rating = Moderate
If Highs = 0 and Moderates = 3 then consensus rating = Low

Resolution Table for N = 9 Raters

If Highs = 6 then consensus rating = High
If Moderates = 6 then consensus rating = Moderate
If Lows = 6 then consensus rating = Low
If Highs = 5 and Moderates = 1 to 4 then consensus rating = High
If Highs = 5 and moderates = 0 then consensus rating must be resolved
If Highs = 4 and Moderates = 2 to 5 then consensus rating = Moderate
If Highs = 4 and Moderates = 0 or 1 then consensus rating must be resolved
If Highs = 3 and Moderates = 3 to 5 then consensus rating = Moderate
If Highs = 3 and Moderates = 1 or 2 then consensus rating must be resolved
If Highs = 2 and Moderates = 3 or 4 then consensus rating = Moderate
If Highs = 2 and Moderates = 2 then consensus rating must be resolved
If Highs = 1 and Moderates = 4 or 5 then consensus rating = Moderate
If Highs = 1 and Moderates = 3 then consensus rating = Low
If Highs = 0 and Moderates = 5 then consensus rating = Moderate
If Highs = 0 and Moderates = 4 then consensus rating = Low